

**PERSONAL**  
*weekly*  
**COMPUTER**

50p April 7, 1984 No 56

**NEWS**

BRITAIN'S BIGGEST WEEKLY

**APPLE'S PLUM**  
A hard look at Mac's software

**SOFT PRO-TESTS**  
New packages for the Dragon and IBM

**VIC-20 PROGRAM**  
Go bananas in only 3½K

**GAMES REVIEWS**  
Screen play for the 64, Oric and Spectrum

**COMPETITION!**  
Win a 96K  
**LYNX**

TODAY & ALL THIS WEEK

**MICRO TALKIES**



*Starring*

*Sinclair* **SPECTRUM**

*Model B.* **BBC**

*'64'* **COMMODORE**

IN THEIR LATEST TALKING ROLES!

PLUS FULL SUPPORTING CAST

A **PCN** FEATURE

A *Micro-Computer-Marvel*

**PLUS: Your complete guide to micro communications**

*— RICHARD EVANS —*

# TELEVIDEO TS 804

## THE MASTERPIECE FOR UP TO FOUR KEYBOARDS

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Initially, you may only need your system to be run by a single operator – expanding it later as the need arises. This is where the TS 804 really comes into its own. As a single-user system it is extremely efficient and powerful. As your business grows, and your requirements change, it will support up to four users – working independently – via any ASCII terminal.

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There's never been anything quite like the new TeleVideo TS 804.

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TS 804 provides a high degree of compatibility with software written for the ALTOS 580 product line.

#### AND THERE'S A LOT MORE...

We simply cannot do justice here to the impressive advantages of the TS 804. For the full, fascinating details, and for more information on the TeleVideo Business Computer range, contact **THORN EMI TeleVideo Marketing**,



Silbury Court,  
372 Silbury Boulevard,  
Witan Gate East,  
Central Milton  
Keynes, MK9 2AF,  
or telephone  
(0908) 668778.

## TELEVIDEO. THE COMPUTER THAT MOVES WITH THE TIMES.



**TeleVideo**  
Business Computers



## REGULARS

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**MENU**

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Cover illustration: Richard Evans.

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## MICROPAEDIA

**Pull out and keep  
Micros and modems**

The second part of our communications Micropaedia features modems, explaining how to fit them easily for use with your micro, and finishing with some plans for the future.

**Competition  
Win a Lynx** 63

Think up a name for the new 96K Lynx micro and you could win one of the five we are giving away.



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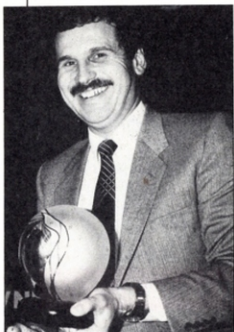
Ape King provides plenty of scope for monkeying about.

**Lynx** 62

This utility gives the Lynx a VAI or string function.

PCN

# ACT sweeps awards



Bob Denton accepts Prism's award.

British companies all but swept the board when the first British Micro-computing Awards (BMA) were presented last week.

The PCN Peripheral of the Year award went to Prism Microproducts for its VTX5000 modem. Selected by the judges for putting the possibility of low cost telecommunications before micro users, it

won by a short head from the Epson RX 80 and the Torch Disk Pack.

In other categories ACT's Apricot threatened to monopolise the hardware awards. Acorn and Sinclair shared the Home Micro title, and Acornsoft's View was named Home Software Product of the Year. Valhalla, from Legend, won the Game of the Year award.

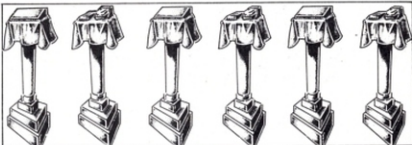
The awards were organised by VNU Business Publications, publisher of PCN and a string of monthlies, and by the Sunday Times. They were sponsored by Thames Television and VLI Computer People.

The awards, intended in the long term to stimulate high standards in the micro industry, have already had a beneficial side effect — a bursary scheme for disabled young people was set up as a result of this first BMA, and £10,000 was raised for the scheme, called Comet.

The audience at the awards ceremony read like a Who's Who of UK microcomputing.

The awards look set to become an annual event; the winners, naturally will be starting a collection of trophies but the nominees who didn't make it were also laying plans for next year's event as they left.

The full list of winners is:



The VLI Computer People Business Microcomputer Award  
**ACT's Apricot**

The Micro Decision Business Software Award  
**Lotus 1-2-3**

The What Micro Home Microcomputer Award  
**BBC Model B and Sinclair Spectrum**

Thames TV's Database Home Software Award  
**View, by Acornsoft**

The Computer Answers Creative Software Award  
**Lisa's operating system, Apple**

Personal Computer Games Game of the Year Award  
**Valhalla by Legend**

Thames TV's Database Software of the Year Award  
**Lotus 1-2-3 and Digital Research's Concurrent CP/M**

Personal Computer News Peripheral of the Year Award  
**Prism's VTX5000**

Personal Computer World Microcomputer of the Year Award  
**ACT's Apricot**

Sunday Times Innovation Award

**ACT's Apricot**

Sunday Times Special Commendations

**Eybridge Braille Systems and Alan Cooke**

## Pace hots up modem wars

After last year's price wars we could now face the wars of the modems. Hot on the heels of the Minor Miracles £115 multi-rate modem another British company has entered the fray.

Pace Software Supplies will launch in a couple of weeks time its Grapevine modem which, like the Minor Miracles WS2000 modem, operates at 300/300 baud full duplex, 1200/75 full duplex and 1200/1200 half duplex. The price will be £143.

In addition to these modes, the Grapevine is capable of operating at 1200/1200 full duplex when used to link two BBC micros using Pace's ROM-based Commstar communications package as a software bridge.

As with other companies Pace has yet to run the gauntlet of the Telecom approval procedure (Issue

52) but is reasonably confident of getting through.

'If we keep on pressing them we should be able to get approval within a couple of months,' said Mr Hudd, Pace's managing director.

Pace has also enhanced its Commstar package to include Prestel terminal emulation and the ability to mimic a variety of computer terminals by loading the configuration routine from disk. The ROM costs £34.

Also included in Commstar is the XON/XOFF protocol together with the X-modem protocol for file transfers between micros.

The 1200/1200 baud full duplex mode of operation is non-standard. The international standard for operating at this rate uses a different method of modulation from that employed at 300/300 and 1200/75 baud.

## Ex-Gamekeeper

The Gamekeeper, which claimed to be Birmingham's largest chain of microcomputing stores, has ceased trading. The co-operative's phones went dead around two weeks ago, and the co-operative liaison officer of West Midlands Council last week confirmed that the Gamekeeper's four shops, in Erdington, Acocks Green, Kings Norton and Coventry, had closed.

Just last month Gamekeeper managing director Tony Noble announced that the chain would no longer supply hardware on the grounds that it was impossible to get supplies.

The Gamekeeper had until then been a major retailer of the Spectra-video micros.

Plans to set up an 'association of retailers or wholesalers to produce a higher standard of service from apparently gone by the board.

## Modem maker moves into telesoftware

The BBC micro's stranglehold on telesoftware is about to be broken with the launch of a telex adaptor for the Sinclair Spectrum.

The adaptor, labelled the TTX2000, comes from OE Ltd — the company that designed and manufactures the award-winning Prism VTX5000 modem.

It is expected to be ready for a

May launch although as yet the telesoftware downloader is not written. OE's Martin Amstell says if the downloader is not ready in time for early May it will be supplied as an upgrade ROM.

The device is likely to cost £125 plus VAT; this is expensive as Spectrum peripherals go but light on the pocket by comparison with the £225 Acorn telex adaptor for the BBC.

The TTX2000 is described as 'like a VTX to use'. It has software on board, automatic boot, four channel tuners, support for 40 columns and full colour display. It uses the same box as the VTX.

## Lamont on top

A forerunner of the software protection scheme banned by the Patent Office and Ministry of Defence is about to emerge in commercial guise.

The first tapes protected by Jim Lamont's Imprint 2 technique are due to roll off the production line at BiBi Magnetics next week. Imprint 1 was the system that fell foul of the MoD as a possible danger to national security (Issue 51); Imprint 2 is an earlier, less comprehensive version — but one that has the backing of several people in the software industry.

'It's not the final answer — there may never be one — but it's a great

step towards it,' a BiBi Magnetics spokesman said.

The technique is expected to add just two pence to the cost of a tape. Mr Lamont intends to use this revenue to set up a means of policing the software scene: 'We intend to do something, not just talk about it,' he said last week.

Imprint 2 is different in style from the banned technique but one of its features is that it can provide evidence of illegal copying which the authorities might act on. Mr Lamont is working closely with the Trading Standards Authority, and he aims to step up the attack on pirates by offering rewards.



# How the West is won

## By Ian Scates

The National Computer Conference is more business-like. Comdex is a harder sell, and some of the glamour has flown south to Las Vegas, but the West Coast Computer Faire in San Francisco is still one of the main events on the enthusiast's calendar.

San Francisco used to be where the Silicon Valley whizz kids came to make their new product announcements. This happens less nowadays but the Faire is an opportunity to hold a damp finger in the air and take a look at what might be on the way to the UK.

Two trends are evident. First, all seems very quiet on the home computer front. After last year's upheavals US companies and investors seem to be giving it a wide berth.

The up-market personal computer area now seems to be IBM's territory with only AT&T and Apple looking like competition.

Many companies are turning to publishing (or wordware, as it has inevitably been dubbed). Books are now seen as being nearly as important as software in that they can enhance the saleability of the hardware.

But there were some interesting new hardware and software releases too. Dimension is a system being billed here as 'the most powerful, most compatible personal computer you can buy'.

'Compatibility' now heads the long list of micro marketing buzz words. Usually there is little need to

qualify what the compatibility is with. Yes, Dimension is compatible with the IBM PC, but it is also claimed to be compatible with most of the programs on most popular micros. The machine is built around a Motorola 68000 microprocessor, but the compatibility claims are based on optional co-processor cards and emulation software which plug into six expansion slots on the machine.

The co-processors are a Z80 for CPM and TRSDOS (among others), the 8086 for the IBM PC DOS and the 6502 for the Apple II+. The machine has met with a warm response in the US, with pundits testing pre-production models and declaring most of the Dimension's claims to be true.

Nor does the machine seem to be terribly expensive. A basic model will sell in the US for around \$4,000. Although it's not likely to be much less in pounds than it is in dollars, the Dimension is also said to be a very powerful micro in its own right. It comes with a wide variety of storage options and RAM expansions. A 512K RAM unit with a brace of 400K 5 1/4 in drives and all the co-processors works out to \$6,230.

Software is in reasonable abundance at the Faire. Of particular interest to UK Commodore 64 users was a musical package which is likely to make the Atlantic crossing at some stage. It's from Waveform Corp and is dubbed MusicCalc 1 Synthesizer and Sequencer. Everyone knows what a synthesiser is, but for those who



Corona's PPCXT: luggable answer to IBM's hard disk XT.

think a sequencer is Liberace's costume designer, it allows you to pre-program the music turned out by the synthesiser.

As music is essentially a series of repeated patterns it performs the musical equivalent of a FOR...NEXT loop on the system. The system produces surprisingly professional results, though admittedly through high quality speakers. The manufacturers claim professional musicians have shown passing interest. The software package is selling for \$49.95. A keyboard and musical scoring software is also being made available.

There was also a similar though more sophisticated system for the Apple II from Syntaur. This comes with a full musical keyboard housing the synthesiser. It gives the player/user a choice of three displays — graphic of a keyboard with the correct key being depressed when that note is played, musical notation, or a set of coloured bars illuminating the selected note value. It comes with a substantial musical learning package. Prices range from \$995 to \$1,495.

The PPCXT, which sounds suspiciously like another expensive micro, comes from Corona and is IBM XT-compatible. It features a 10Mb Winchester drive, a 360K floppy

and 256K of RAM. It also comes bundled with the Ultimate word processing package and a TC Tutor self-teaching program. The US price has been set at \$4,895.

Memory may be expanded up to 512K and standard features include a built-in 80-character by 25-line amber display with a resolution of 640 by 325 pixels, an RS 232 port, Centronics port and 83-key PC-type keyboard.

Corona claims the PPCXT is compatible with most of the software available for its progenitor, the IBM PC XT. UK Corona distributor Midlectron has yet to see the product which will also be put through its paces at the Hanover Fair this month, but the company says it is looking forward to seeing the machine on its shelves in the near future.

Like other 'compatible' manufacturers, Corona has recently been in the IBM firing line regarding BIOS copyright. In February Corona undertook to re-write the necessary code to be 'non-infringing', expressing confidence that its engineers could do the job without sacrificing any compatibility. According to Midlectron there will be no problems either with the earlier IBM-compatible models or the new PPCXT.



Dimension statement: claiming all-embracing compatibility.



MusiCalc: setting the tone for Commodore 64 users.



## VIEW FROM JAPAN



## Rising sun fears eclipse from QL

By Tom Sato

It was in mid-January this year when the Sinclair QL hit the technology page of the influential Nippon Economic News like a shock-wave. It left the Japanese computer companies totally dumbfounded.

The specification seemed too good to be true; 68000 CPU, 128K RAM, two built-in microdrives and two RS232 interfaces, for £400. Even the Japanese, who are renowned for their cheap high technology electronics, could not produce a computer with that kind of specification at that price.

A technical development sub-manager of the computer division of Matsushita said: 'The specification sounds excellent but the sums don't add up. We can't see how they could possibly make any money out of it.'

The comment comes from one of the biggest consumer electronics companies in Japan. It admits to being a late starter in the field of computers but recently had encouraging success in a joint venture with Fujitsu, producing up-market 16-bit business computers through a company called Panafacom. It also produces semiconductors but simply could not believe anybody could produce a 68000 computer at £400.

Even when it is explained that Sinclair excels at using ULA technology to reduce the number of components, thus reducing costs, the company was still sceptical.

It was even more worried to see a copy of PCN with the picture of Uncle Clive accepting the millionth Spectrum last December. The entire Japanese computer industry cannot reach that figure.

Another mystery to Japanese micro makers is that Sinclair won't be selling the QL over the counter till next year. The Spectrum was delayed by three months for the initial mail order customers and it wasn't widely available until early 1983. The QL seems to be moving in that direction, too. In Japan selling computers by mail order direct from the manufacturer is unheard of. As for the delays, they consider it totally ridiculous.

One director of a small electronics firm commented that if a Japanese computer company didn't supply the goods three months after the customers paid the bill, there would be a riot outside the headquarters.

A group of managers at NEC, the biggest electronics company in Japan, also asked: 'How can Sinclair make any kind of profit out of this QL computer? Who is this crazy person?'

But, the question is, can QL really capture the business market? Sinclair has a reputation for poor reliability as far as delivery is concerned. Business users won't stand for three weeks' delay to replace a machine. Also because QL has a non-standard operating system there is little or no software, save from Pson.

Japanese companies like NEC are good at producing reliable, standard, CP/M or MSDOS machines.

But the Japanese are deterred by the volatile computer market in the US. Texas Instruments pulling out of the home computer market and the Osborne crash came as great shocks.

They also fear the American giants like IBM and Apple. They tend to treat the foreign computer market with extreme care, exporting only the products they are sure will make a profit, such as printers and RAM chips.

Perhaps they are too careful, with the result that some Japanese products are totally ignored in Britain. Isn't it about time the Japanese plucked up the courage to battle it out with Sinclair and IBM? Now that would be interesting.

Sord has just launched a hand-held computer with a name that suggests it might be ready for the fray. The micro is called the Success, otherwise known as the IS11, and comes with a 4MHz Z80A, 32K RAM and 64K ROM.

The machine, with built-in applications software, has been launched in Japan at £500 but it looks to be designed for the US market.

# Sinclair goes back to school

On show at the Sinclair Education Exhibition at Westminster last week was an array of software for schools as well as such diversions as micro trolleys, keyboard overlays, travel bags and a graphics pad.

Toddlers could toddle up to Mirrosoft's stand where Count with Oliver (an elementary maths program) and Look Sharp, an exercise in memory and perception, were on display.

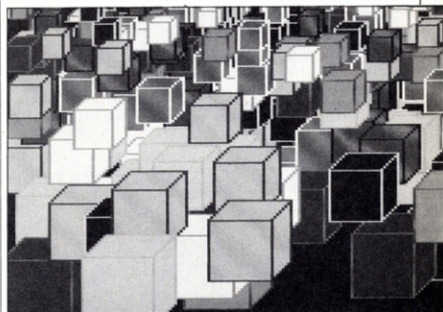
These were just two of the myriad of programs for the 48K Spectrum. Others included numerous science programs and plenty more for maths — prices ranged from £5 for Jive Software's Model Maths to Griffin Software's Chemistry. Physics and Biology suites due out next month for around £12 each.

Languages would cut a larger hole in your pocket at £24.95 for MDA's French, Spanish and German programs, or you could give yourself a break from language to see how the inside of a car works, using CALPAC's packages featuring the innards of aeroplane and car engines.

The bulk of software displayed was for the 48K Spectrum, with one or two programs compatible with Sinclair's Microdrive. These included publisher McGraw Hill's new word processor for the Spectrum as well as Profile 2, a spreadsheet/file handling program — both cost £13.95.

On hand was Microvitec with its latest colour monitor supporting high-resolution graphics at £258.75. The Department of Education and Science is also getting involved; it showed some Microdrive software in the form of Control Basic and Control Logo, both £5 and compatible also with the BBC and Apple.

British Micro, meanwhile, was demonstrating its Grafpad for the 48K Spectrum. This £143.75 device is for home use, and the company, best known for its Mimi micro, plans a version for the IBM PC. Sirius, Apricot and other business micros for June. This version will have an RS232 interface and cost under £172 says director Manas Heghayan.



Pop art — Dimension Graphics will help you promote your software by making a screen dump to an ink-jet printer for you. Prints are large — 12 x 16ins — cost about £5 each, and the quality is superb. The company is offering discounts for bulk print orders — it will also supply four colour separations at £10 a set. Dimension Graphics has modified its machines so it can freeze a screen from any game. Contact Paul Wynder on 0282-812037.

## Bean sprouts strike back

In a coals to Newcastle deal Kuma Computers has brought a Japanese-written Spectrum game to the UK.

Vegetable Crash comes from Hudsonsoft, which despite its Anglo-Saxon name is as Japanese as Sharp. It concentrates on software for Sharp systems, and Kuma hopes to introduce its Hu-Basic and Hu-Cal for the MZ700. But it also publishes games for the Spectrum,

and Vegetable Crash could be the first of several imports through Kuma.

'The programs we've chosen are very good and it (Hudsonsoft) has some different ideas — games here have been becoming much of a muchness,' said Kuma's Jon Day. Vegetable Crash illustrates the different slant of the Japanese — the game features death-dealing vegetables. It costs £6.95.

Kuma's agreement with Hudsonsoft is reciprocal and UK software will be going in the opposite direction. Kuma is on 07357 4335.

# Olivetti twins

Olivetti has gone one better than the herd by launching two IBM compatibles, the M24 and the M21.

The M24 is a fairly standard PC work-alike, with a slightly smaller footprint, and more expansion slots than the PC has available, but the M21 is a pint-sized transportable that is in the running for the title of the smallest IBM compatible launched so far. Olivetti claims that they're to all intents and purposes totally compatible.

Taking its cue from the micro press, Olivetti had both machines running the Microsoft Flight Simulator at last week's launch. This

program has become a de facto benchmark for PC compatibility. Microsoft Windows, which hasn't officially been delivered yet, was also up and running, and was clear evidence that Olivetti has friends in high places.

The machines themselves have near identical specs. The CPU is an 8086 running at 8MHz and the basic machine has 128K RAM plus two 360K 5.25 in. floppies. You can expand RAM to 640K and 720K floppies are also available. There's also a facility for running a 10Mb disk on the M24 — it could also run on the M21 but an Olivetti spokes

man reckons the disk isn't robust enough to move around a lot.

The M24 scores over the IBM by having seven expansion slots, and serial and parallel interfaces already built in.

The IBM keyboard problem has been solved with a fudge; you can either get a standard IBM layout or a more logical Olivetti one, with 18 function keys.

The M24 is going to be the main focus of Olivetti's attention over the Summer. It will be available from May, probably priced just under the IBM PC, while the M21 isn't liable to come on the market until



M21 — 30lbs of IBM functionality.

September, after the 24's production has been built up. The 21 will cost about the same as the PC Portable.

## Imagine goes into reverse

Imagine has made an abrupt about-turn on its plans to cut prices on its games software to £3.95.

The reversal by the Liverpool software publisher removes the threat of extinction from smaller companies. 'We hadn't appreciated the effects of our action on the market place,' said Imagine director Tim Best. 'It would put smaller software houses out of business and that's not the kind of action we are in to.'

While the smaller firms had howled with pain at the original decision (Issue 53), it appears that some of the large ones were less concerned.

Imagine's dithering on pricing is perhaps a reflection of the state of the games market. There has been a

dramatic fall in sales since Christmas and some software companies have cut back their advertising budgets as a result.

Other companies see this decline as an opportunity for themselves. Sulus Software of Bath believes that there will be an increased demand for educational software. 'The public is clearly bored with arcade-type games,' said director Elizabeth Edmondson. 'They want something more worthwhile.'

There is some indication that this malaise in the games market is not restricted to the UK. American company Penguin Software has announced that it is increasing its disk-based software from \$19.95 to \$29.95 because of increased production and advertising costs.

Gowling Marketing Services is predicting micro software sales will total £12.6 million by the end of the year. This has to be set against earlier estimates of £20.0 million.

## IBM opens windows on PC

IBM UK has brought the 3270 PC across the Atlantic.

Launched last October in the US (Issue 34), the 3270 PC is likely to be a cog in a corporate computer user's wheel with its communications facilities, its large memory and its £4,600 price tag.

## ACT's spoils

ACT's attempt to buy the manufacturing rights to the Sirius from bankrupt Victor Technologies has advanced another stage.

The board of Victor has agreed the terms of the deal which leave Victor with the distribution rights for the micro in North and South America. Victor will also earn a royalty on each machine that ACT makes.

But it may prove to be a significant addition to the PC family because it marks IBM's implementation of windows on a micro. Seven windows are available on the 3270 PC — four displaying data, two notepads, and one working area.

There are still a few hurdles for ACT to overcome as the deal with Victor is subject to negotiation of the detailed agreement and approval by the bankruptcy courts. The deal has already been approved by the major creditors.

Meanwhile Chuck Peddle, founder of Victor Technologies, has announced that he is close to launching an IBM-compatible version of the Victor 9000, the sister machine to the Sirius that only differs in its external styling.



## SOFTWARE

### The new releases

#### Home

**Commodore 64:** Keep track of all those household finances with Home Budget from Kuma Computers (07357) 4335, price £9.95.

#### Games

**BBC:** Find out where the MCC touring team went wrong? Check out Test Match from CRL (01-533 2918) or Cricket from Peaksoft (0283-44904). The Peaksoft game is available for other micros.



This week's special — Leasemaster (clean, good runner).

**Spectrum:** Still on the sports theme CRL has released a 3D simulation of the Olympics (not the whole lot, just 14 events). Micromega has brought out another game featuring 3D graphics called Codename Mat, a variation on the save-the-Earth-from-alien theme with a few novel twists. If danger and quick reactions are more your taste look out for Timebomb from CDS Micro Systems (0302-744129). Monty Python comes to the micro screen with Quest for the Holy Grail from Dream Software (0256-25107) which also has on offer a do-it-yourself adventure program called Dungeon Builder. Meanwhile Phipps Associates (01-393 0283) has doubled the size of the map in the Forest (an orienteering game) to 11,200 square km.

**Oric:** Pasta Blasta from Arcadia

(0792-403363) is the first in what is described as a trilogy of games called Pasta Wars.

**Apple:** P & P Micro Distributors has extended its list of imports with a mystery called Murder by the Dozen from CBS Software; Legacy of Lyl-gamyn, third scenario in the Wizardry series; and Jumpman from Epyx which features four variations of play and 30 game levels.

#### Business

**BBC:** Two integrated accounts packages have been released for small businesses. Small Business Software is from Acornsoft and Integrated Accounting is from Diamondsoft (061-485 8705).

**Epson HX-20:** Leasemaster (0962-52593) can be just the thing for the car salesman on the move who wants to make instant leasing and HP calculations.



Murder by the Dozen — overkill!

**IBM PC:** Cut your energy bills with the Energy Cost Management System from Allied Aims (0283-45320) and get an IBM PC thrown in. The whole package costs £8,500.

**CP/M, MSDOS, PCDOS:** Planstar is the latest release from MicroPro (01-879 1122) and provides a financial planning and reporting system with 32,000 cells per spreadsheet, 1,000 spreadsheets per project and graphics. Sage (0632-761669) now has an enhanced version of its accounts package called Sage Plus. It features 9,999 accounts as opposed to 999.



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 Writing line: 10.5" 126 character line  
 Line spacing: 6 lines per inch  
 Paper Feed: Friction, single sheet or fanfold.  
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**DATAPLUS**

PCN 5



# Sperry makes major bid for IBM market

Sperry, the mainframe specialist, is the latest in the growing list of companies to announce an IBM PC compatible micro.

But the Sperry Personal Computer offers a number of plus points that are designed to give it an edge over IBM.

Although prices are not yet finalised, it looks as though it will undercut IBM by around 10 per cent on a like for like comparison. The Sperry PC also has a serial RS232C interface as standard together with an 8088 processor that runs faster than the version used in the IBM PC.

In addition it has enhanced

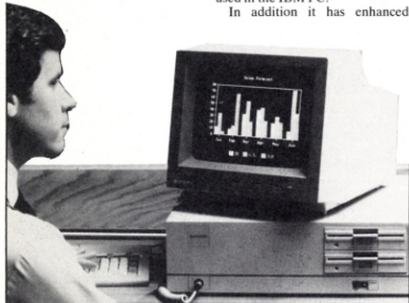
colour graphics, a battery backed-up clock and a slightly remodelled keyboard. The high resolution versions of the Sperry PC can generate 256 colours (compared to IBM's 16) on screen at resolutions ranging from 320 by 200 pixels up to 640 by 400 pixels.

With the additional features included as standard there is plenty of scope for expansion with five spare slots on the basic machine and three on the high resolution hard disk version.

Sperry is claiming a high degree of compatibility with IBM and in support of the claim it cites a survey carried out by a US magazine that put Sperry at the top of the list of PC clones, with a compatibility of 99.44 per cent.

As one would expect from a mainframe company, a range of micro/mainframe communications facilities are available as optional extras.

The Sperry PC will be announced this week at the Hanover Fair for delivery to corporate customers later in the year and to dealers in September.



Sperry — aiming to edge out IBM.

## Rapid drop

The price of VisiCorp's VisiOn mouse-driven software has come down sharply as the original Windows/Icons/Mice programs (WIMPs) begin to look outlandishly expensive.

Rapid Terminals, UK distributor of VisiOn, has slashed the price of the applications manager from £375 to £80. This element of VisiOn is central to the system and the reduction will make VisiOn more attractive against competitors, but the applications that it drives still push the overall cost up.

VisiOn starter packs reflect the cut to the applications manager. A bundle with spreadsheet, graphics and mouse costs £735; with word processing added the price is £970. Both prices are exactly £200 below their tags at VisiOn's UK launch last year (Issue 39).

VisiOn, having no icons, was never a true WIMP but when it was first publicised it looked like a reasonable low cost alternative to Apple's Lisa. Since then events have moved on — Microsoft and Digital Research have developed similar systems on the back of operating systems, Apple has cut the cost of Lisa and introduced Macintosh, and third-party software suppliers have not flocked to VisiCorp's standard.

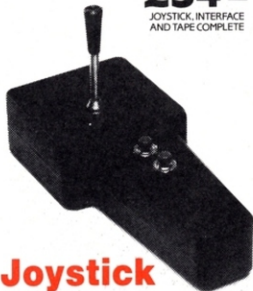
Rapid is on 0494 26271.

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JUKI6100 .....	£375.00
STARDELTA 10 .....	£365.00
KDCFT5001 .....	£259.00

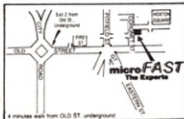
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009 ; professional way.  
010 ;  
011 row GBY Row Version  
012 ;  
013 cond not row  
014 org \$1900  
015 else  
016 org \$8000  
017 endc  
018 ;  
019 ;start: ldx #0 ;string print routine  
020 ;l; ldx msg,\* ;set the character  
021 ;brq 2; ;finished?  
022 ;sr osacc1 ;brn print it  
023 ;inx  
024 ;brn 1; ;and continue.  
025 2; rts  
026 ;

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Issue 55 (March 31, 1984)

"This game is of a remarkably high standard, especially given the limitations of the Oric. I'd be hard pressed to think of any arcade game that combines the use of graphics and sound to better effect, so if you own an Oric you need this game. All credit to Joe the Lion."

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You will receive your adventure by return post.

PCN1



# PCN CHARTS

# GAMES

No.1



		GAME TITLE	PUBLISHER	MACHINE	PRICE
▲	1 3	Fighter Pilot	Digital Integ	SP	£7.95
▼	2 1	Chequered Flag	Psion	SP	£6.95
▲	3 2	Manic Miner	Projects Bugbyte	SP, 64	£7.95
▼	4 5	Scuba Dive	Martech Durell	SP, 64, OR	£6.95
▲	5 4	Atic Atac	Ultimate	SP	£5.50
▼	6 6	Ant Attack	Quicksilva	SP	£6.95
▲	7 7	Hunchback	Ocean	SP, 64	£6.90
▼	8 11	Flight	Psion	SP	£7.95
▲	9 19	Wheelie	Microsphere	SP	£5.95
▼	10 16	Stonkers	Imagine	SP	£3.95
▲	11 12	Chinese Juggler	Ocean	64	£6.90
▼	12 15	Lunar Jetman	Ultimate	SP	£5.50
▲	13 10	Hobbit	Melbourne	SP, AC, 64	£14.95
▼	14 22	Jet Pac	Ultimate	SP, VIC	£5.50
▲	15 24	Fred	Quicksilva	SP	£6.95
▼	16 30	Pool	CDS	SP	£5.95
▲	17 8	Rev. of Mut. C's	Llamasoft	64	£5.95
▼	18 —	Blue Thunder	Richard Wilcox	SP	£5.95
▲	19 9	Alchemist	Imagine	SP	£6.50
▼	20 14	Mr Wimpey	Ocean	SP, 64	£6.90
▲	21 13	Death Chase	Micromega	SP, 64	£6.95
▼	22 —	Bugaboo	Quicksilva	SP, 64	£7.95
▲	23 27	The Snowman	Quicksilva	SP	£6.95
▼	24 28	Blogger	Alligat	64	£7.95
▲	25 17	Skull	Games Machine	SP	£6.95
▼	26 —	Pinball Wizard	CP Soft	64	£5.95
▲	27 18	Space Shuttle	Microdeal	SP, AC, 64, VIC, DR, OR	£8.00
▼	28 —	Night Gunner	Digital Integ	SP	£7.95
▲	29 —	Horace & Spid.	Psion/Melbourn	SP	£5.95
▼	30 —	Twin King, Vall.	Bug Byte	AC, 64, VIC	£9.50

# MICROS

Top Ten up to £1,000

Top Ten over £1,000

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▶1	1	Spectrum	£99	SI
▲2	3	VIC 20	£140	CBM
▼3	2	CBM 64	£229	CBM
▲4	6	BBC B	£399	AC
▼5	4	Dragon 32	£175	DD
▲6	8	Atari 600XL	£150	AT
▼7	7	Oric 1	£99	OR
▲8	10	Apple IIe	£750	AP
▼9	5	ZX81	£40	SI
▶10	9	Electron	£199	AC

TW	LW	MANUFACTURER	PRICE	DISTRIBUTOR
▶1	1	IBM PC	£2,390	IBM
▼2	2	ACT Sirius	£2,525	ACT
▲3	5	ACT Apricot	£1,760	ACT
▼4	4	Apple III	£2,755	AP
▲5	3	DEC Rainbow 100	£2,359	DEC
▼6	—	Olivetti M20	£2,180	OL
▲7	8	Wang Professional	£3,076	WANG
▼8	9	NCR Decision Mate V	£1,984	NCR
▶9	7	Kaypro 10	£2,595	CKL
▲10	—	Data General Ent 1000	£2,645	DGL

These charts are compiled from both independent and multiple sources across the nation. They reflect what's happening in high streets during the fortnight up to March 8. The games chart is updated every other week.

Neither mail order nor deposit-only orders are included in these listings. The prices quoted are for the no-frills models and include VAT.

Information for the top-selling micros is culled from retailers and dealers throughout the country and is updated every month.

PCN Charts are compiled exclusively for us by RAM/C, who can be contacted on 01-892 6596.



## Caught out by Catch 22

I wonder how many others have been caught in the Catch 22 created by computer manufacturers.

Lured by the specifications, I was an early purchaser of the Oric-1, for which I paid in those heady days £175. The machine never came up to the advertised specification, but I was not too unhappy with it. However, I am appalled to think I will have to part with, perhaps, a further £50 to obtain the machine I should have had to begin with, with but a few decorative differences.

I am a disabled middle-aged man, living on a pension. Money is perhaps tighter for me than for some and I now have to decide whether to find £50 to 'upgrade' to the machine I thought I should have had over a year ago. I cannot afford not to if my interest in computing is to be maintained, or I will soon have an obsolete machine on my hands. Why is it always assumed that computers are the playthings of the rich and young.

Some older, poorer types get a lot out of them too.

A Tatum,  
Dover, Kent

## Hand faulty goods straight back

I never fail to be amazed at the poor quality of some hardware and software on sale. My advice to readers who have received extremely poor quality products is to decide whether the product is sub-standard (*ie* does not do completely the job it is supposed to do) then if not to take or send it back to the vendor.

### PCN £10 Star Letter



If the vendor cannot give you a replacement with the faults eliminated, you should get your money back. If the vendor refuses either, you have recourse to the Trading Standards Office whose address and telephone number can be found in the Yellow Pages. Most chain stores will give you your money back if you insist that the product is below standard.

If you have purchased software and find it does not load after a while, or has got corrupted, you can send the tape or diskette back for a replacement. This is because you have not only bought the media, but the software on it as well — some publishers might charge for the replacement, but this is unusual. As an example, Melbourne House replaced my *Hobbit* free of charge,



## Don't carry a LOAD on your shoulders, unburden yourself on PCN's letters page.

even though I pointed out that the tape may have been damaged by a faulty cassette recorder. They even sent the cheque I had sent for the return postage.

Poor software is rife as many readers are well aware — but this can also be classed as sub-standard. I got my money back when I returned an assembler package because the version I had truncated the assembly display so parts of statements were missing. This was not the only fault, but the fault that would demonstrate the product to be sub-standard.

Users should not only read magazines to be made aware of rogue products, but can improve the overall quality by not accepting such products and making the supplier aware of this by returning them. An incredibly inadequate piece of software is not a joke.

John Davies,  
Burton-on-Trent, Staffs.

## Why should authors expect so much...

Taking up points raised in *Random Access* (Issue 51) by C Ketchell: when paperbacks were invented and cost 6d (2.5p) and hardbacks cost two shillings, George Orwell reviewed the first batch of Penguins. He made two points that are pertinent to the software price debate.

Someone with two shillings to spend on books (*ie* the price of a hardback), is more likely to buy paperbacks, but unlikely to spend the full two shillings on books. However, many people who couldn't afford hardbacks could afford paperbacks, so booksales, in terms of sales value, would increase. The only people who suffered were the private lending libraries.

Sadly, there have been too many stories about 16-year-old software millionaires, so too many authors expect to make a mint on the game. It is unrealistic for software authors

to expect to make a living from their writings, any more than book authors do.

So let's have lower royalties and cheaper software, and make piracy uneconomical, which is the most potent weapon we have against the pirates.

Software publishers have one advantage over book publishers — their medium, the cassette, is readily reusable, unlike paper. While stock investment may be high for any one program, a high proportion of the investment can be reused for another program should the first program prove unpopular. Pushing the analogies further, (and why not?) shouldn't somebody be collecting all this software in a National Collection? How else will researchers of the future learn that the first political arcade game was *Prunes of Penge*?

Pruce Ollet,  
Crowborough, E Sussex

## ... price the pirates out of business

Would someone explain why I can go into any High Street shop and purchase a music cassette for half the price of a computer cassette? Classical or pop?

A cassette of Beethoven's 9th Symphony, running for 1½ hours and containing the skilled product of a complete symphony orchestra plus a large chorus, typically a thousand man hours of work (including rehearsals), is barely comparable with a computer program running for 1½ minutes and the product of a 100 hours' work.

Games programs, in particular, frequently appear to be copies of each other, (how many variants of *PacMan* have you seen?) but this apparently has no effect.

With both Commodore and Sinclair claiming to have sold over 1 million computers each, the old excuse of the specialist market cannot be true.

We, the customers, are frequent-

ly accused of piracy if we make back-up copies of our own property, but with current prices, the industry has only itself to blame.  
Mr B Wigglesworth,  
Wateringbury, Kent.

## Misleading ads — is it deliberate?

I'd like to draw readers' attention to a practice I don't think is fair.

I was searching for a new printer and really wanted an Epson since I knew they were reliable. As I could in no way afford an FX80 I had to consider the RX80.

Looking at the ads led me to believe that the RX lacked a lot of the features of the FX, mainly the underlining, sub and superscript, italics and the CRT graphics.

The dealers I visited backed this up, so I found myself looking at Epson compatible printers which offered the features that the RX lacked. Eventually, though, I found a dealer who knew the RX and surprisingly I found it had all the features just mentioned.

Are the dealers who place the ads genuinely unaware of the features of their goods or is this an example of an expensive model being enhanced in buyers' eyes by implying (and, in some cases, stating) that it has more advantages over the cheaper model than it actually has?

Pete Gaunt,  
London NW10

To avoid this, it might be wise to get information from the manufacturer before going shopping — Ed.

## QL — I'll wait till May or Christmas

There has been much criticism in the past month of Sinclair's QL. Not about the machines, but the lack of them. With headlines such as 'QL may be creating a captive audience' and 'Disillusionment in wake of QL days' I was feeling quite disheartened. I think people are missing the point — the QL is a good computer.

I would be prepared to wait till the end of May for one. Unfortunately, I can not afford one since I am only eleven years old, but (don't tell anyone) I'm waiting to see what I get for Christmas'. With Psion developing a database for those who subscribe to QLOB it seems well worth the wait.

J Parker,  
Stechford, Birmingham

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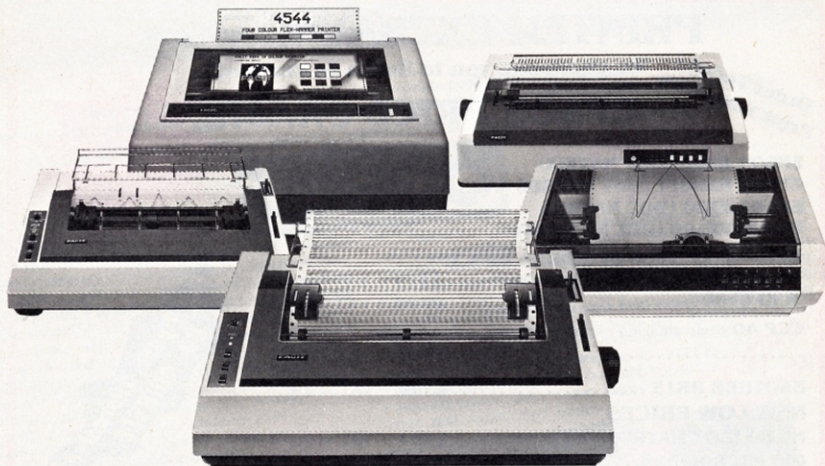
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Oxford Street, London W1A  
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## CBM cassette wants prime position

**Q** I recently purchased a Commodore 64 and I am delighted with it, however I have two queries. First, when I try to load a program, after a few seconds the screen shows — "Ready" and the program has not loaded. But when I move the cassette away from the computer and television set the program loads perfectly.

Second, is there a home finance/management program available for 64?

A Yates,  
GT Yarmouth, Norfolk.

**A** Funny things, cassette recorders. As you've discovered, electrical equipment can sometimes be fussy as to where you put it and this applies particularly to computer equipment. The thing is that any piece of electrical equipment generates an electromagnetic field and this, in turn, can affect any other electrical activity. Your program is transmitted to the computer along the cassette cable. By putting your cassette player next to the TV (a strong generator of electrical activity) you run the risk of corruption of the current in the cable. The answer, as you've already discovered, is to keep the cassette unit away from other electrical appliances.

On your second point, you've made a good choice in the 64 which has a good range of semi-serious software packages. Commodore does a variety of home and professional utilities. Without more details it's difficult to help, but Kuma Computers (07357 4335) has a program called Simple Accounts at £24.50 which may do the job.

## Alphacom into BBC will go

**Q** Can you please tell me if it's possible to connect the Alphacom 32 printer to the BBC Model B, as I am upgrading from the Spectrum and would like to continue to use the

**Alphacom printer.**  
T K Gaff,  
Barrow-on-Soar, Leics.

**A** Among the Spectrum owners there is one who would dispute your use of the word 'upgrading', but if you call Advanced Digital Systems on Portsmouth (0705) 823825 you can check out the Peripheral Interface 4. This allows the ZX Printer to be connected to the Beeb, so should also work for the Alphacom.

It costs £24.95, and if you don't still have your Sinclair power supply you'll need a separate power supply for it. ADS sells this for £5.95.

## Oric I/O explained

**Q** The sales leaflet for my Oric-1 states that the centronics printer port can be used as a general purpose I/O line.

I want to use my Oric to decode morse and teleprinter signals and want to feed data in and get data from this port.

I've tried everything possible to find out the addresses, but even Oric isn't forthcoming with the information. Is it possible to access the port and does it need one address for inputting data and another for sending it out?

David Dunn,  
Llandegfan, Anglesey.

**A** The addresses you need are on page 3 of the Oric's RAM, which starts at #0300 (768 decimal). In particular, #03E1 is port A, #03E0 is port B. You can't use port A as it's used to map the VIA controlling registers onto page 3.

In theory, to get data out through port B, you would first set address #03E2 (the direction register for port B) to 255. Then, you would POKE data to the port with POKE #03E0,x (where X is a datum).

You might want the external device to set the acknowledgement (ACK — pin 19 of the printer socket) line of the printer port high to signal the Oric to wait before sending data. Your Oric I/O routine would have to AND(PEEK(#03E0)) with 16. If the result is 16 (ie bit 4 set), the external device is not yet ready for the next datum. When the ACK line drops low,

(PEEK(#03E0)) AND 16 will not be 16, so you can POKE #03E0 with the datum, and so on.

To get data in, you'd reverse the direction of port B with POKE #03E2,0, then PEEKING #03E0 should give you access to the incoming data.

You may need the Oric to signal an external device to wait until the Oric is ready to receive. This can be done by POKEing the PCR register at address #03EC with 240. When the Oric is ready, you can POKE #03EC with 192 to send the line low as a signal that the Oric's ready to receive. The PCR register sets the STB line (pin 1) of the printer socket, so this is the line the external device should be checking.

Generally speaking, Basic should be fast enough to receive incoming data, but if it isn't, you'll have to resort to machine code, in which case you'd find a data sheet on the 6522 VIA (Versatile Interface Adaptor) invaluable.

## Microdriven to distraction

**Q** Two weeks ago I received two Microdrives from Sinclair. I thought they'd be the end of my program storage and access problems, but I was wrong.

The Microdrives needed 0.5K of memory to act as a buffer, and my program for storing data on my dairy herd didn't have this amount of memory to spare. Nor did the Pision programs Vu-File and Vu-Calc due to the lowering of RAMtop. I cured my program by making minor alterations, but failed with the two machine code programs.

Is there any way of saving these two programs and other machine code programs?

Tim Overton,  
Gillingham, Dorset.

**A** As far as we know, there's no way to operate Vu-File and Vu-Calc with the Microdrives, short of a complete rewrite of the programs. This is because the memory locations used conflict badly with those used by the Microdrives.

You can replace Vu-File with Masterfile from Campbell Systems, on 01-504 0589. This is definitely Microdriveable, and is a better program anyway.

The Vu-Calc replacement is liable to be a little more difficult, and you might be best waiting until Pision implements it on Microdrive.

As regards conversion in general, this is tricky, but it can often be done. We'll be publishing an article showing you how to do it in Issue 58.

## Self assembly for the Beeb

**Q** I am a BBC owner and would like to get to grips with its assembly language. I know of at least three books on the subject, especially written for the BBC micro, namely those written by Birnbaum, Ferguson and Shaw, and one recently published by Smith.

Yet so far I still don't know which one to buy as I would like to get hold of a book which covers most of the ground of assembly language of the micro. I would, therefore, appreciate it if you were to suggest the best buy.

George Scerri,  
Ghaxaq, Malta.

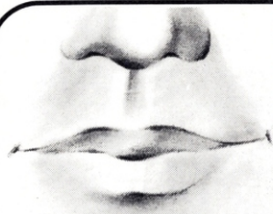
**A** The best way of learning machine language is to get the data sheet for the processor then use an assembler and write programs with it.

Starting with simple things like loading and transferring the registers to and from memory locations, you can then build up to more difficult operations such as jumping and branching.

The data sheet is generally included as an index in most of the books available. When buying one, make sure that this section is present.

The only things to be learned from books are the ins and outs of the architecture and what each command does, in detail. You will probably find that none of the books available covers the whole topic from top to bottom. Though there are a number of magazine articles which may be of help.

Since the instructions on how to use the assembler are included in the BBC user guide, the only book you really need is one that almost 'tells all' about the 6502 processor, *6502 Assembly Language Programming* by Lance A Leventhal published by McGraw Hill.



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Up-to-date Mid-Cheshire Computer Club keeps both the public and themselves informed.

If your association has something special on the agenda or if you've just started a new one, contact us at *Clubnet, Personal Computer News*, VNU, 62 Oxford Street, London W1A 2HG.

## Mass meeting spreads word

Mid-Cheshire Computer Club is taking microcomputing to the masses — or at least to the townspeople of Winsford, Cheshire. One of the main activities of the 100-strong club recently has been a series of open meetings where members of the public have had the chance to use and play with micros, as well as learn a bit about Basic.

'People come to us to learn about micros and we're only too happy to teach them,' said club organiser Nick Pounder.

The club has solved the problem of where to meet by gaining use of Winsford public library twice a month and keeps in touch with hardware developments by giving alternate meetings over to machine de-

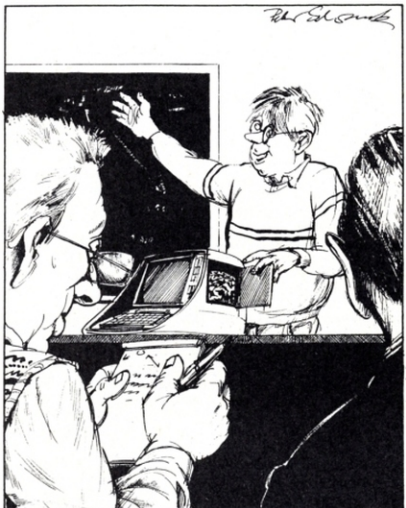
monstrations. Recently they have seen an Apple Lisa, a rare Sinclair QL, an IBM PC and at the lower end of the scale, a Tandy Colour Computer.

On the software side, a recent demonstration covered educational packages for the BBC Micro — a subject close to the hearts of many of the club's members. 17-year-old Nick is an A-level student of economics and maths, while other members are using a Spectrum to compile a database for a geography A-level project.

Wendie Pearson

Name Mid-Cheshire Computer Club Venue Winsford Library, Winsford, Cheshire Meetings Twice monthly Contact Nick Pounder tel 0606 888299.

Our complete listing of clubs and user groups will continue to appear occasionally. In the meantime Clubnet will bring you news of new clubs and events.



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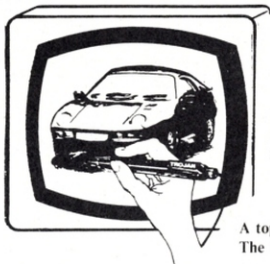
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Other titles in the series include *Using the Commodore 64*, *The Beginner's Guide to Computers and Computing*, *Sprites & Sound on the 64*, *12 Simple Electronic Projects for the VIC*, *Will You Still Love Me When I'm 64*, *Advanced Basic & Machine Code Programming on the VIC*, *Advanced Basic & Machine Code Programming on the 64*, as well as *Pocket Handbooks for the VIC*, 64, Dragon and BBC Model B.

Write in for a descriptive leaflet (with details of cassettes).



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New developments are bringing home micros towards the speech standards of minis and mainframes.

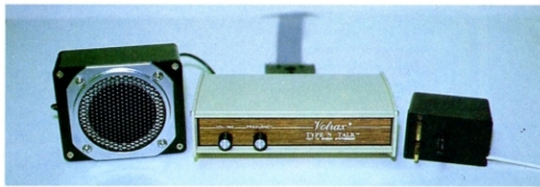
Text-to-speech technology is one area rapidly being improved. It avoids the vocabulary limitations of digital speech — about 200 words — and the complications of allophones, and enables you to type in

what you want your micro to say. A new device from Votrax, called Type 'n' talk, does this for the BBC, and Commodore ports to release a text-to-speech cartridge for its speech synthesiser, Magic Voice.

The other half of speech technology,

voice recognition, is also undergoing rapid development. Until recently these devices used speech or noises as switches. Now, however, you can teach your micro words and use them to control it. Such is the case with Micro Command from Orion Data Systems which works with the Spectrum and costs just £50.

## On speaking terms



### Votrax Type 'n' Talk

Type 'n' Talk is a buff coloured unit with a range of sockets across the back and two twiddle-type knobs on the front. An on/off switch completes the picture.

Our unit came with a power supply, an RS232 to BBC RS423 lead and an external speaker (which looked like part of a car stereo system).

Cyber Robotics will provide you with the unit, power supply unit and a manual. The speaker and leads can also be bought for an extra £40, though it would be cheaper to buy these yourself — any old 8 Ohm speaker will do, and an RS232 lead is the only other bit you need.

To get going you simply plug in the unit, using strings of ASCII characters to make it speak. Doing this from the BBC is simple: using \*FX codes in a program you can transmit streams of data from the RS423 port, which the Votrax interprets and voices. It burbles into life when you first switch it on, with words that remain a mystery. However, clear or not, this lets you know that the unit is working.

Since the Votrax we used was borrowed from a blind person it had no documentation. Instead we used a program giving the \*FX commands needed to make it work with the BBC. If you get the unit from Cyber a 30 page manual is provided, giving the connecting instructions, a vocabulary, phonetic and alphabetic tables and examples, although you don't need written information to use the unit.

To test the unit we used a simple program to speak words from data statements, which allows experimentation and puts gaps between words to improve results.

As text-to-speech relies on the device saying certain sounds strung together, you must think phonetically — *I luv u* works better than *I love you*. This stringing together of sounds means you can use any language; French and German were both used successfully.

### Verdict

It takes refinement and patience to get what you want from this device, and like other speech synthesisers it sounds like a dalek — human emulation is still a long way off. But it is a step in the right direction and easier to use than most allophone systems, with the same, potentially infinite, vocabulary.

**Product** Votrax Type 'n' Talk **Manufacturer** Votrax **Price** £316.25 inc VAT **Interface** RS232 **Distributor** Cyber Robotics

### Micro Command

Joysticks took control of the computer one step away from the keyboard; speech input takes it another. Micro Command allows you to control the Spectrum from a microphone, by teaching it words and then using them as controls from within programs.

Like many Spectrum speech peripherals, Micro Command is a black oblong plug-in box. There's no socket on the back so you can't then plug Interface 1 or 2 into it. Let alone a speech synthesiser — a logical addition to voice input. If the speech synthesiser you want to use has an edge connector on its back you could plug Micro Command into this. The microphone provided plugs into an earphone socket on the top of the unit.

The key to the package is the accompanying cassette which contains programs to help you use Micro Command and master its idiosyncrasies.

Two A5 card manuals are professionally presented, but the main (blue) manual is rather insubstantial. The 'additional information' yellow pamphlet is more useful, giving programs and detailed explanations of how to use Micro Command in your own programs.

This unit can be extremely frustrating. The principle of voice recognition is that you train a device to understand your voice. In practice, however, you train yourself to speak consistently, which takes

a lot of patience. If you can't do this you'll find Micro Command very tiresome.

One of the first programs gets you to say up and down, showing how well Micro Command understands you by making figures on the screen move up and down on request — or not. You must have a success rate of over 80 per cent to move on to the next part, and frustration soon builds up. The cassette leads up to a voice-driven version of an uninspiring game where you round up sheep.

While training yourself in accurate repetition it's best to lock yourself in a soundproofed room to reduce background noise and embarrassment. Using the speech routines provided from your own programs is more rewarding as you begin to feel in command. You can define up to 15 words, though this requires a long learning phase.

### Verdict

It's frustrating learning to use Micro Command, but after that it's entertaining to use. Despite the picture on the cover showing father and son bellowing at the unit, it can really be used by only one person at a time, ideally in a silent room.

Speech is a subjective area of computing. Many people would rather use a keyboard than a speech unit or a joystick. However, the future should be interesting for those who like their machines to answer back, and to speak when spoken to.

23 ▶

**Product** Micro Command **Manufacturer** Orion Data, (0273) 672994 **Price** £49.95 inc VAT **Interface** Spectrum **Outlets** Retail







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## PCN PRO-TEST PERIPHERALS

### Commodore connection

The Votrax Type 'n' talk can be connected to a Commodore 64 via the Interpod RS232 link, or any other RS232 connection. Once set up for the correct baud rate and parity etc, communication can begin.

The following programs are examples of what can be done. Notice that, in general, any words can be entered to produce intelligent speech output. To obtain better pronunciation it is sometimes necessary to resort to using letters and letter combinations that sound correct although they do not read correctly.

The phonetic method of producing speech, as used in the Votrax, is far more flexible than the systems that use predefined words and phrases although the Votrax does seem to have a number of predefined words in its vocabulary and, at time is able to use these to make more sense from words.

The Commodore Programmer's Reference Guide contains full details of using RS232, but generally the interface will be recognised as device 2. However, using Interpod, it becomes device 4, as in the following examples.

This simple program will speak any phrase you type in:

```
10 OPEN5,4
20 INPUT">";A$
30 PRINT#5,A$
40 GOTO 20
```

Remember to CLOSE 4 if the program is exited using RUN/STOP.

The following is a short list of RS232

```
10 OPEN5,4
20 PRINT#5,"HELLO THERE I AM THE VOTRAX
VOICE SYNTHESIZER"
30 PRINT#5,"I THINK THAT P C N IS A
RATHER GOOD MAGAZINE"
40 PRINT#5,"DO YOU AGREE"
50 INPUT A$:IF A$="Y" THEN PRINT#5
,"WUNDERFUL" ELSE PRINT#5,"HHHMMMPH"
60 PRINT#5,"WHAT IS YOUR NAME"
70 INPUT A$
80 PRINT#5,"HELLO ";A$;" HOW ARE YOU
FEELING TODAY"
90 INPUT N$
100 PRINT#5,"AH YOU ARE FEELING ";N$
110 PRINT#5,"IS THAT GOOD OR BAD"
120 INPUT A$
130 IF A$="GOOD" THEN PRINT#5,"OOOOH
GOODY FOR YOU" ELSE PRINT#5,"OH
DEAR WHAT A SHAME"
140 PRINT#5,"BYE BYE ";A$
```

Talk to your micro 8 interaction with Votax

interfaces.

VIC 20 RS232 Interface (works for the 64 as well),

Maplin Electronic Supplies, Southend 552911,

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Interpod,

Oxford Computer Systems, Oxford 812700,

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Commodore 64 RS232 interface, Commodore UK, Slough 79292.

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The arrival of Commodore's SFD 1001 double-sided quadruple-density disk drive has brought 1Mb of disk storage on-line for £570.

People wanting to use the Commodore 64 for serious work have been hampered in the past by the absence of a fast and reliable disk drive. The serial IEEE 1541 is extremely slow, and goes out of alignment notoriously quickly. Some DOS protected disks can also maltreat the operating system, and this aggravates the problem.

The death of the 4040 disk drive (the ideal alternative, if a little short on capacity) worsened the problem. The only other choice was the 8250 2Mb drive which, although desirable, is prohibitively expensive.

### First impressions

The SFD 1001, in its casing, is not much bigger than the 1541. Each disk holds 1Mb of data (formatted), compared with about 170K on a 1541 disk. This increase in storage brings media costs down, but makes the risk of data loss greater, though this can be prevented by regular backing up. High density also means you spend less time changing disks and finding the one you want.

### Setting up

The 1001 is a parallel IEEE device, which means that it's compatible with earlier Commodore computers like the Pet and the 3032, 4032, 8032 and 8096 business machines. However, the 1001 is not directly compatible with the 64. Fortunately there are several interfaces to connect the 64 to one of the parallel drives — these include the Dams, the Interpod, the ICL and the Buscard (the last two were reviewed in Issue 56). Doubtless there are others.

### Documentation

One user reference manual covers the whole range of IEEE parallel drives, and explains that the 1001 is basically half an 8250 dual drive. The manual is thorough, though a little inconvenient to use because of the large number of devices covered together. Full details are given of both simple and advanced programming with the drives, and of the various disk formats. The commands for the 64 are given in an appendix since the manual assumes Basic 4 (the standard business basic) is being used by your machine.

### In use

The drive is much faster and more reliable to use than the standard 64 drive, the 1541, and the time taken to move from track to track is less than that taken by the 8050, or even the 8250. The time spent reading the data from disk or writing to it should be exactly the same as on the 8050 and 8250 drives, so the real extent of your gain will depend on the sort of work that you are doing. If you are only loading small amounts of data the track-to-track time improvement is not great, but if you are doing random access continuously — for example with a database application, loading large programs or bringing in large files to a word processor or spreadsheet

# MORE IN STORE

A new 64 1Mb disk drive gets a spin from Barry Miles.



program — the speed improvement is dramatic.

A spelling checking program (giving access to 28 separate files) takes four and a half minutes to run on a 1541 drive, two and a half minutes to run on an 8050 drive and one and a half minutes on the 1001.

The most important feature of a new drive is its compatibility with existing models. The 1001 is incompatible with the 1541 but does have a read/write compatibility with disks formatted on the 8050. There is a slight problem with this: an error is generated the first time that an 8050 disk is used in the 1001 drive. After this first access there are no problems. This is not a serious problem unless you have software that accesses the disk — without sufficient error trapping this could easily crash.

Commodore can supply you with a short program that POKES data into the RAM of the disk drive. This tells it that instead of being half an 8250, it is in fact an 8050. This program gives complete read write capability, but you can no longer use both sides of the disk.

If you already own an 8050 the program will give you a dual drive system, which means easy backing up and software compatibility. Whether or not you use it depends on whether you are prepared to sacrifice that much storage space.

The choice of disks can be controversial: there is some difference of opinion about whether a quad-density drive can rely on disks without a reinforcing ring. The latest information from ANSI is that quad-

density drives should be used with disks without reinforcing rings. Commodore's manual says the same thing, but years of using an 8050 drive disks with and without the reinforcing ring have produced no problems. Against all probability the 1001 chewed up a top quality quad-density disk without a reinforcing ring, even though it was treated carefully.

A call to Commodore revealed that data is stored rather unconventionally by the 1001, with more on the outside of the disk than the inside, and the drive works best with double-density disks (rather than quad) with reinforcing rings. The latest version of the manual reinforces this by telling you to use the 1001 with reinforcing rings on its disks.

### Verdict

The drive was completely reliable in use, and the access and retrieval times are extremely attractive. It is compact and efficient, and at £570 including VAT represents good value for someone who wants a more reliable and higher capacity drive than the 1541 for the 64. It is a pity that the 1001 is not directly compatible with the 64 leaving it to the user to find a suitable interface but there are many available at reasonable cost.

**Product** Commodore 1001 disk drive  
**Manufacturer** Commodore Computers, 675 Ajax Avenue, Trading Estate, Slough, Berks. Tel: (0753) 74111 **Price** £570 inc VAT **Interfaces** Dams, Interpod, JCL, Buscard **Outlets** Retail.



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Add a powerful math routine with Kevin Ball's machine code program.

# A matter of factorials

Many pocket calculators have a factorial function (usual notation is  $x!$ ). The factorial of a number,  $x$ , is defined as follows:  $x!$  (read *x factorial*) is equal to the number of different ways that  $x$  objects can be arranged. For example, if you have four books on a shelf, then you could arrange them in twenty-four different ways ( $4! = 24$ ).

There are many applications for factorials in the field of pure mathematics; a principle one is the calculation of infinite series used to expand functions.

Although many pocket calculators have factorial functions, small micros do not. The short routine below enables your Spectrum to calculate factorials. Though the factorial function is not as commonly used as others (sine, square root, etc) it is still an advantage for the computer to be able to calculate them. One use that cries out to be mentioned is repeated iteration of infinite series to produce closer and closer approximations to base functions.

The way a factorial is calculated is as follows: the number is taken, and multiplied by the number minus one, then that number minus one, and so on until one is reached. For example:  
 $4! = 4 \times 3 \times 2 \times 1 = 24$   
 $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$ .

The factorial of 1 is 1; the factorial of 0 is also 1. There is one unique way of arranging no objects, just as there is one unique way of arranging one object.

The method is simple in programming terms, and looks like a simple line of Basic, thus:

```
LET FACT = 1: FOR F = 1 TO X: LET FACT = FACT * F: NEXT F
```

which runs quite satisfactorily for values up to about 5!, but try running it up to 30!, in slow Sinclair Basic, and with a Return statement at the end of it so that you can call it as a subroutine. The delay is considerable.

Fear not. The speed of Z80A machine code comes to the rescue, with the added advantage of taking up only 142 of your precious bytes (16K machine owners take note).

One major disadvantage of using machine code routines within a Basic program is the problem of transferring data from the Basic usable form into a form the machine code can use, and vice versa. Usual techniques are poking into a reserved and protected memory location, or sitting the machine code in the way of the processor interrupts so the routine is called 50 times a second. Both these methods and

others take extra time, thereby defeating the object of the exercise, which is to speed up the processing time.

This routine is not burdened with such cumbersome data transfer methods. Every effort has been made to make the routine virtually instant, and clear to the Basic programmer wanting to use the routine. It is possible to treat the routine almost as a built-in function of the interpreter that sits in the ROM. To use the new factorial function of your Spectrum, set the variable  $x$  equal to the number that you require the factorial of eg LET  $x = 4$ , then call the routine (RANDOMIZE USR start address), which will return you to Basic almost immediately, and the variable 'fact' (short for factorial) will contain  $x!$  You can put the routine anywhere in RAM that you can find one hundred and forty two consecutive free bytes (over-writing the UDGs, in a REM statement, in a string array in the variables area, just above a lowered RAMTOP etc). The only requirement is that the variable 'fact', into which it will place the final value, is initialised before the routine is called (LET fact=0). However, if you forget, the routine will not crash but merely return the standard 'Variable not found' message. Likewise if  $x$  is not set.

If you pick up a calculator and try the factorial function with a few numbers you'll see they get rather large very quickly (10! is over  $3\frac{1}{2}$  million), and a calculator will usually not express numbers larger than  $10 \times 10^9$ . However the humble Spectrum cops out with floating point values over 33! If you accidentally set  $x$  too large, the routine will (usually) give you the error message 'Number too big' or 'Integer out of range' or (very occasionally) return a default value of one — a bug which I have been unable to iron out, but which is only occasionally generated, and when  $x$  is out of range anyway.

Of course, factorials also have to be positive integers.

For your interest, the routine actually uses full five byte floating point arithmetic, stack manipulations, and calls to the floating point calculator subroutine in the ROM.

Lastly here are certain expansions of common infinite series for use with the factorial routine.

Maclaurin's expansion is used to work out the expansions of simple functions, and the general binomial expansion is used when evaluating functions of the type  $(1+x)^n$ . Note:  $f^{(r)}$  is the  $r$ th derivative of the function  $f(x)$ .

```
10 INPUT "Input the start
address for the routine (length=143 bytes):" : Ia
20 CLEAR (a-2): LET a=PEEK
23730+256*PEEK 23731+2: LET
aa=a
30 PRINT AT 20,3; FLASH 1;
"Dumping code: please wait"
40 FOR n=1 TO 10: READ z#
50 FOR f=1 TO LEN z#-1 SET
P 2
60 LET h=CODE z#(f)-48-7*(
CODE z#(f)+
64)
70 LET l=CODE z#(f+1)-48-7*
*(CODE z#(f
+1)+64)
80 POKE a, (h*16+1): LET a=
a+1
90 NEXT f: NEXT n
100 DATA "21045B3666233661"
110 DATA "2336632336742336"
120 DATA "2E23367823362E2A"
130 DATA "5D5CE521045B225D"
140 DATA "5CCDB2283006122"
150 DATA "5D5CCF01E521095B"
160 DATA "225D5CCDB2283007"
170 DATA "A1E1225D5CCF01E5"
180 DATA "EF605238610FCFE"
190 DATA "023013E1E1233600"
200 DATA "2336002336012336"
210 DATA "00233600102CD113"
220 DATA "2A655CEB010500ED"
230 DATA "B0EB22655CEFC0C1"
240 DATA "023EFE1E0A1030C"
250 DATA "04C10E0E38CD1423"
260 DATA "4710EFEFE138E1CD"
270 DATA "6C2BE1225D5CC9"
300 CLS
310 INPUT "Input x: " : ix
320 LET fact=0: RANDOMIZE UR
SR aa: PRINT x; "! = "; fact:
GO TO 310
```

## Maclaurin's Expansion:

$$f(x) = f(0) + f'(0)x + \frac{f''(0)x^2}{2!} + \dots + \frac{f^{(r)}(0)x^r}{r!} + \dots$$

$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots + \frac{(-1)^n x^{2n+1}}{(2n+1)!} + \dots$$

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots + \frac{x^r}{r!} + \dots$$

## General Binomial Expansion:

$$(1+x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \dots$$

$$\frac{n(n-1)(n-2)x^3}{3!} + \dots$$

$$+ \frac{n(n-1)(n-2)\dots(n-r+1)x^r}{r!} + \dots$$



Go back to biblical times with Mike Gerrard for the first adventure in our special feature section.

# Hit the road, Joshua

The adventure is possibly the most creative form of program available on a home micro; arcade games come and go but adventures maintain their popularity. Over the next few months PCN will publish an occasional column on what's new, interesting and puzzling on the adventure scene.



We start with *Jericho Road* from Shards. This is possibly the first adventure from a Baptist Minister (with the appropriate name of Peter Goodlad.) Many adventures have you praying for guidance, but this must be the first where, when you type Help you are told 'See Mark Chapter 11, Verse 15.'

The adventure is based on the New Testament. A time capsule transports you to the first century AD, where your task is to make your way from Jerusalem to Jericho, locate a sign, discover its four meanings and bring it back to Jerusalem. The problems may not be on the Scott Adams difficulty level, but the program is enjoyable and interesting because of its historical accuracy.

Steve Maltz of Shards (189 Eton Road, Ilford, Essex) saw the author on TV last April, when he was interviewed about the Spectrum games he was writing. One of these was an early version of *Jericho Road*. Steve Maltz said 'we spent three months testing and debugging before releasing it. Mr Goodlad is doing a sequel but he's moving north to Galilee. You can guarantee it'll be accurate — *Jericho Road* has been seen by fellow ministers, so if there'd



been a single fact wrong he'd never hear the end of it.'

Mr Goodlad explained that the new program will probably be set 20 years earlier. 'Doing that enables the player to witness some of the events from the Gospels. It's very challenging—it has to be accurate without allowing the player to drastically alter the outcome.'

The *Jericho Road* program accepts two-word commands and directions by their initial letters. Help sends you scuffling for a Bible, though one unfortunate omission is a save routine — perhaps it should be called a Lazarus routine. However, with the information from solv-



ing earlier riddles there's no need to cover everything again, though it can be a nuisance when you lose your life beyond Jericho, and have to start back in Jerusalem.

Once you have begun to sketch out a map, you're told this will be a reasonably accurate plan of the ancient city of Jerusalem.

Apparently, one of the exits was known as the Dung Gate — a good indication that you need to proceed with caution. Stand at the Dung Gate and look, and behold, a smelly, burning rubbish tip. You should always check out exits other than the visible ones. The Reverend Goodlad does prove rather devious in places for a man of the cloth. Can you trust no-one these days?

Another problem is changing your denarii (Roman coins) into the shekels

(Jewish) you need in the market. Heathens will probably need help. One of several amusing features is the opportunity to haggle in the market. If you don't like the first price you're given, don't accept it... it may well come down. At another point you're asked for someone's name, which is one I'm sure most people won't know without looking it up in the Bible.

When you've explored Jerusalem and set out for Jericho, you pass through or



near famous Biblical places: the Kidron Valley by the Garden of Gethsemane, the Mount of Olives, Bethlemeh and the Dead Sea. It's important to befriend people and find somewhere to eat and shelter in the



wilderness—you know what lions think of Christians. At one point you witness the re-enactment of a well-known parable, complete with sound effects.

*Jericho Road* is text-only, though a few milestones are depicted, and to be honest it's not an adventure which will keep seasoned players puzzling for more than a few sessions. However, it is entertaining with appeal for anyone interested in biblical history. PCN

If you're puzzled, why not drop us a line, and we'll try to help. Write to us at Adventures, PCN, 62 Oxford St, London W1A 2HG. We can't answer inquiries individually, but we'll get round to you.



# Of Mice and Macs

At second glance Ian Scales finds the Macintosh impressive

In issue 46 PCN Pre-Tested Apple's new Macintosh. This time, as promised we'll take a closer look at the Mac as a system — its software, its printer and how they work together.

## Hardware

To recap, the Mac uses a 68000 main processor, 64K of ROM, a respectable 128 of RAM and feeds all this with a single hard-shelled 3½in, 40K Sony disk drive.

Its other notable feature is its "mouse" which allows you to manipulate the menus and control functions, draw shapes on the



screen and just about everything else except actually enter text and data. This, you'll be pleased to hear, is left to a conventional keyboard.

The result of all this is displayed on a small, but eminently readable monochrome screen (the one colour keeps up the resolution without gobbling up vast amounts of video RAM). Styling is another interesting Mac feature. Some have called the Mac Ugly (I like it, but you can see for yourself). What may not be apparent from the illustrations is the dinky dimensions. The high-rise approach to the hardware design has left the Mac taking up little more desk space than a telephone. It has also made the machine "luggable" if such is your want, and Apple with supply a shoulder bag for the purpose. The keyboard too is quite small.

Another interesting point is that Apple has "sealed" the Mac. Expansion options will be daisy-chained through a high-speed serial bus system and these are rumoured to include such goodies as a modem and a parallel interface.

Early last year, Apple released the Lisa. That particular computer was, and still is, horrendously expensive. At the time it was seen as an important product, not because it was likely to sell in great quantities, but because it set a certain standard in user-friendliness. Apple had thrown a gauntlet to the rest of microcomputer industry. This, Lisa seemed to say, 'is the ease-of-use level that the public is going to require for the next generation of personal computers. Let's see who can match this at an affordable price.'

There quickly followed an upsurge in mice as manufacturers realised the public thought mouse and easy-to-use software went claw in hand. Other concerns self-consciously took different approaches. Microsoft decided that windows (where two programs could be run concurrently in different parts of the screen with data transferred between them) represented a respectable improvement over the conventional single program approach.

While Apple's Lisa software meant applications had to be written to take advantage of the completely new operating system, other companies balked at this rather risky 'great leap forward' and took the more cautious option of attempting to improve the personalities of those applications programs already up and running under MSDOS.

Hewlett-Packard decided it was time to dust off its old favourite, the touch-sensitive screen, for its entry into the personal computer market (see issue 55). Apple, meanwhile, was busy conceiving a little brother for Lisa — Lisa-type technology at an affordable price.

MacPaint is an instant draw (can't resist) program. Here's the palette from which the user chooses his tools. In normal paint mode the L shape on the left and bottom of the screen remains as well as the top line.

By putting the cursor over the appropriate token you can choose implements like a paint brush, a pencil, rubber, lasso (for moving picture elements about the page) and even a hand for moving the page about under the window.

Using various brushes and textures (available from a pull-down menu and from the patterns at the base) patterns can be 'sprayed' onto page at various levels of intensity using a conceptual spray can, or brushed on in 3D ribbon shapes.

The mouse can also be used to position and dimension rectangles, ellipses and TV screen shapes. Still, a Macintosh does not necessarily an artist make, as you can see by these attempts to carefully fill in the shapes with various textures. If you accidentally rub out lines with the rubber or wish to add some straight ones there is an icon which gives the cursor the ability to 'rubber band' a straight line between two points.





## Operating system

What Apple has tried to do with the Mac is improve what goes on between the user and the software, rather than what goes on between the data and the program. In many ways this is sensible. There seem to have been only four 'types' of personal micro applications program so far invented — a word processor, a database, a spreadsheet and a graphics package. Given this it hardly seems sensible to try to invent a better mouse trap, when the users seem quite satisfied with the ones they have. But cheese to go on it, well that's something else again. Apple calls its cheese 'Lisa technology'. It's basically a way of representing functions by small on-screen symbols or 'icons'. For instance, the routines necessary to rid the system of a file are generated when the user manipulates the mouse to position the cursor over a small waste bin in the corner of the screen. You push the mouse's single button and the file is zapped into the vortex.

All the other functions are undertaken in a similar way. In Macwrite, the Mac's word processor, there is a collection of 'pull down' menus. You position the cursor over a word on a status line at the top of the screen, press the button and a small document unfurls over part of the text (see illustrations).

More applications software will eventually become available and it will be (comparatively) cheap. But the surprising thing about what we've seen so far is that once you get past your mouse and icons, there's not much here that hasn't been seen before. This is not to say that Macwrite and paint aren't good programs — they are, but it never fails to surprise how little actually changes. No doubt somebody will soon have Wordstar running under the Mac operating system and the Mac's chances of 'hit' status will become assured.

Given this, it may well be argued that Apple has taken an eminently sensible path. Until someone comes up with another program idea as good as Visicalc, it's either do what Apple has done or churn out endless, obscure 'ultimate' word processors and the like.

Perhaps the main disappointment with the Mac was its file handling — it is fairly conventional. Normally this wouldn't really be a criticism, but when a manufacturer starts plonking 16/32 bit chips in a personal computer you would expect this to be one of the most important areas with which to start being innovative.

Good file handling would seem even more important given the Mac's single drive. Although the drive has the interesting habit of automatically ejecting disks, the way the files are organised and the various system routines necessary to have lying about either on disk or in memory to do simple opening and closing jobs make us think that most users will soon find the extra disk drive option more a necessity than a luxury.

This is unfortunate, for one of Apple's price trade-offs was the single disk route. Now it appears that it wasn't a very good trade-off after all. While Mac uses the mouse and the icons, it isn't able to do the multi-tasking which made the Lisa the

Leave the mouse in the hands of an artist, however, and after half an hour or so you'll probably get something like this. MacPaint will not turn a computer hobbyist into an artist, but it certainly enables artists to quickly master the system without any onrush of techno-fear.

This is the document which arrives after you select the OPEN FILE option from the pull-down menu under the word File (see below). It's a fairly self-explanatory — the icon labelled Mac is the file (or document as Apple likes to call it) containing the review. Paint documents appear under the brush icons. Two clicks of the mouse will load up a selection or you can drag it across to the Trash at the lower right of the screen.

Once you've loaded up a document file you can change type styles or sizes. These are the Fonts available. If you want to mix fonts you simply highlight the area of text you want changed, bring the cursor down the menu to the required font, release the button and the text highlighted is changed. The Style menu will change the size, outline, produce **Italic** or **bold** type, etc.

darling of the executive desktop. So while it has lots of potential power it's definitely hampered by its unwieldy storage and low memory. In normal circumstances 128K Ram and 400K on-line would be perfectly acceptable, but the Mac's ease-of-use qualities really start and finish with the icons and mouse and this is a shame because it comes so close.

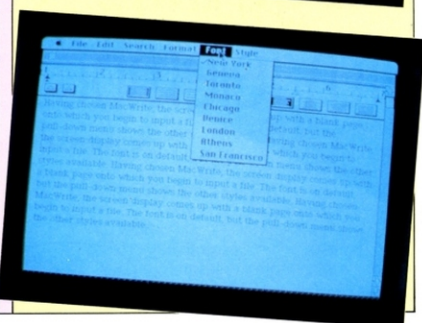
## Verdict

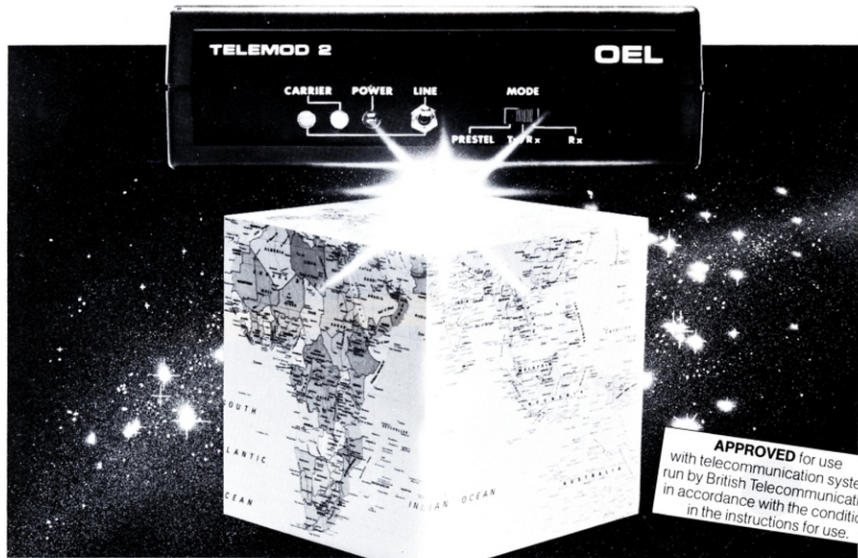
The question is, has the Mac had its usefulness eliminated by compromises. The product must be delightfully easy to sell — if the term sexy can ever be ascribed to a collection of high technology then the Mac is probably X-rated. But while this may gladden the heart of the Apple dealer, it doesn't really do the user much good if,

once the novelty wears thin the Mac is found to be simply a computer on which you can draw pretty pictures as well as do the average application programs.

This said, priced as it is, the Mac can do many jobs admirably. Even if you include £350 for the excellent printer, and another few hundred for an extra disk drive, it is one of the most competitive products around. For word processing there is nothing to touch it and my guess is that this is what it will end up being used for most, with a little financial modelling on the side.

The Lisa front-end technology takes a little getting used to for those used the conventional "BDOS ERROR ON B" approach but there's little doubt that the machine is targeted straight at the first time buyer. As such it's a winner.





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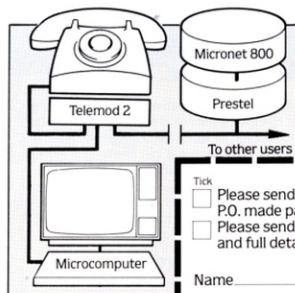
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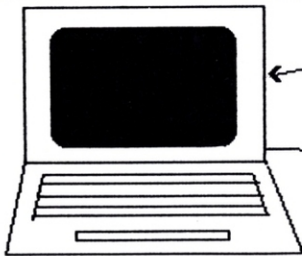
†Please allow 28 days for delivery.



## PCN PRO-TEST HARDWARE

The Macintosh's Imagerwriter printer is capable of producing high-quality graphics. It operates by doing a 'screen dump' of everything produced in either MacWrite or MacPaint.

The printer takes the screen image bit-by-bit and transfers it to paper. This is accomplished by the print head taking a couple of "passes" in front of the paper, particularly with large-type characters.



Macintosh

Mouse

Keyboard

Labelled technical diagrams are easy to develop using the line-drawing and fill commands on MacPaint.

# The Daily Da

## Something fishy is happening in Derby



Fishermen in Derby were upset today when they found out that the local fishpond had been entirely removed to make way for a new motorway.

The motorway, to be known as the M1-5, will link Moscow with all towns in the UK making it possible



Even detailed artistic drawing are possible with the Mac.

The Mac and Imagerwriter can also be used to 'mock up' layouts for publications.

In addition to the graphic facilities available in MacPaint and MacWrite, you can

use many different typefaces and in different typesizes.

But alternating between one typeface and another can be annoying and make things difficult to

read. Using underlines and boldfaces can make type more interesting, but not as interesting as if you turned the type **nbziq6 qomv**

A large number of typefaces are possible within both MacPaint and MacWrite, including bold and inverse, plus other tricks.

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**INTRODUCING  
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IAN SINCLAIR

**'Introducing Commodore 64 machine code' by Ian Sinclair published by Granada at £7.95 (paperback, 146 pages)**

If ever there was a misleading book title, this is it. After reading this boring text, I'm still trying to work out what it has to do with the Commodore 64.

The blurb explains that sooner or later you'll feel restricted by Basic, and that for really fast operation and control, machine code is the answer. It even goes on to suggest that keybeeps might be possible. Wow!

It's written by well-known

author Ian Sinclair and it's the same old formula.

Hexadecimal and binary arithmetic and suchlike are essential but boring subjects to learn. But, if you can package them together with plenty of programming examples and things to do, you could be onto a winner.

But Ian Sinclair introduces the subjects in a drawn out manner, and the result for me was loss of interest.

No real projects are tackled and, worse, none of the outstanding features of the Commodore 64 are used.

It all adds up to an elementary book which gives the novice a long read with nothing much accomplished and little new knowledge about how the 64 works. **DI**

**'Polishing Your Apple Vol 2' by Herbert M Honig, published by Howard W Sams, distributed by Prentice-Hall at £4.20 (paperback, 107 pages)**

What a pity the publishers of Herbert Honig's second volume of *Polishing Your Apple* didn't decide to package this book with a disk — it would have made it far more usable.

Though there's plenty of solid information inside, it isn't particularly accessible.

The book aims to build on the experience Volume 1 provided. It addresses aspects of programming more concerned with making the basic logic, developed in Vol 1, into solid reliable programs.

Much of the work is based on a largish program called Money Tool Jr, which performs most of the functions of Mr Honig's Money Tool, also published by Sams, but as a disk. Money Tool Jr is listed in the back of the book, and really should be typed in before useful work can be done. The same is true of other support programs listed throughout the text.

The main body of the text comprises detailed examinations of each part of various programs. This is the best part of the book as each line and variable is inspected, and all interactions are explored. The only weakness was that Mr Honig doesn't cover alternatives to the methods he uses.

Money Tool Jr may be a cut-down version, but it's still ten pages long, and has 355 lines, many of which have

multiple statements. It even has 15 comments. Generous to an extreme. It's not fair to ask the reader to type that lot in, perfectly, before being able to make sense of page 1.

But despite being a demo, Money Tool Jr demonstrates good Applesoft programming, and the techniques shown are worth studying.

This is a case in which stricter editing would have helped by guiding the author into a different order and method of presentation, or publishing the book with a disk. **RK**

**POLISHING  
YOUR APPLE**

Volume 2  
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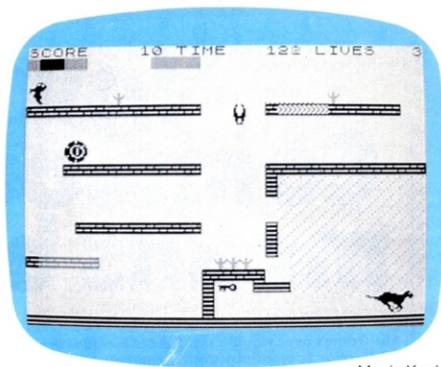
Thinking ahead



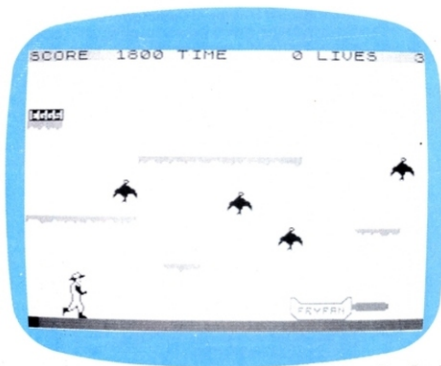
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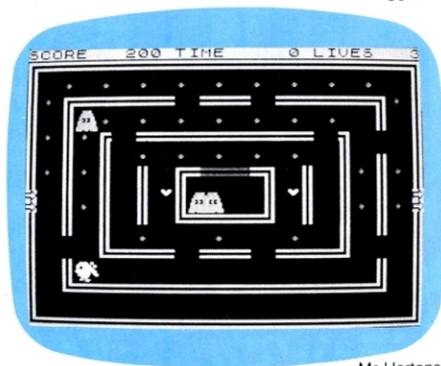
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All versions of "The Hobbit" are identical with regard to the adventure program. Due to memory limitations, BBC cassette version does not include graphics.

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PCNT/4





# PCN

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Vol 20

Part 2

**PULL OUT  
AND KEEP**



*Modem summary*

*Phoning the Future*

*Dealing with Duplex*



# COMMUNICATIONS, MICROS AND MODEMS

## HARDWARE TALK

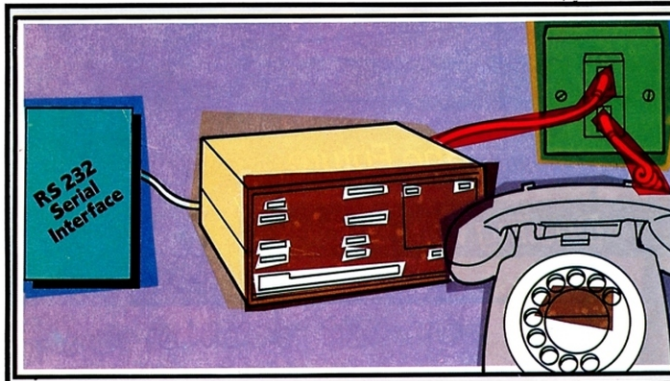
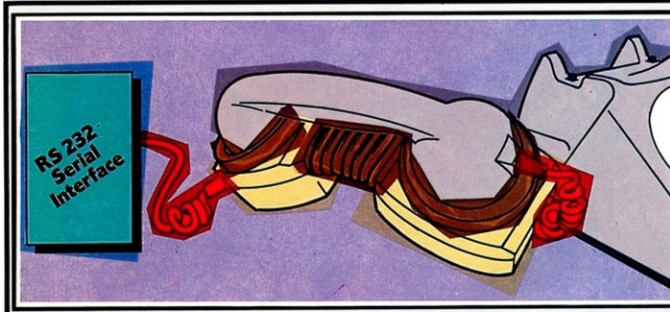
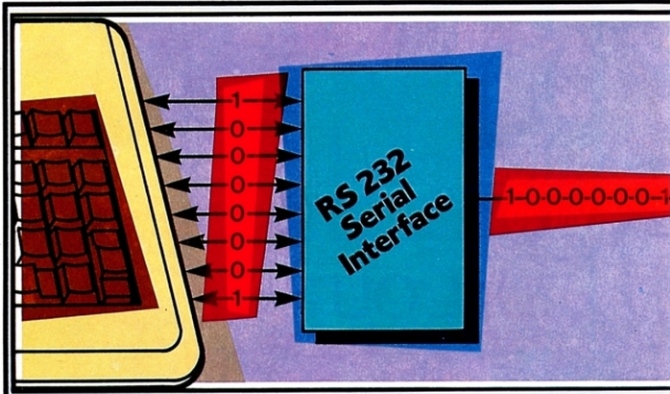
Deciding how to connect up your hardware is the next step in the process of using your micro as a communications tool. In choosing the hardware to suit what you think are your needs it tends to be a case of the more you pay the more features and flexibility you get.

One of the main variables with modems is transmission speed. Buying a modem with a wide range of these tends to put the price up rather substantially. So remember, while this flexibility may be useful if you plan to use the facility for a wide range of tasks, under normal circumstances you may find that a simple 300 baud send/300 baud receive setting will suffice. 300/300 seems to have become a standard for most of the hobbyist bulletin boards worldwide. However, all this seems to be changing. There is at least one hardwired modem with a wide range of transmission/receive speeds for under £100 (see overleaf).

Once you've decided on speed, it's time to start thinking about whether you should go acoustic or hardwired (see the boxes on this page). The relative prices of the two types seem to have swapped about over the past year or so, with simple hardwired modems coming out cheaper. Most of these use the new Telecom standard plug arrangement, so it's a simple process to install a two-way adaptor at the Telecom plug in the wall and run your telephone and modem without any inconvenience.

Most hobbyists won't require facilities like auto-answer. If your computer already has an RS232 interface it should be possible to configure a modem for well under £100. Micros without serial interfaces are a little more problematical. There are add-on serial interfaces available for the Spectrum, plus a purpose-built unit complete with serial interface, modem and Prestel firmware built in.

All you have to worry about after this is terminal software, the various 'status' parameters which must be set if the interface and modem are to work properly. This will be covered in depth in this issue.





## **RS232 SERIAL INTERFACE**

Communicating through the telephone system initially requires the configuration of a device to convert the internal parallel binary numbers with which the computer deals into serial form so they can be carried on the line.

For most users the device that does this very necessary job is likely to be an RS232 serial interface. The RS232 is usually built into the micro, though in some cases it can be configured as an extra card or add-on. It takes the parallel byte one bit at a time and sends the individual bits down the wire one after the other. An RS232 has at least five wires heading out to the outside world. They handle transmit, receive, request to send, clear to send and signal ground respectively.

The bytes are usually sent with a cluster of other bits around them to perform certain functions. The RS232 can usually be configured through software to sandwich the byte in a start bit and end it with a parity bit and stop bit.

RS232s work with a series of standard speeds to synchronise the sender and receiver. These speeds are known as baud rates

and range from 75 baud (the slowest) to 19,200 baud (the fastest). The most commonly used speeds are 300 receive / 300 send or 1200 receive / 75 send.

Baud rates relate to the number of bits sent per second, but as we observed above, these rates cannot be applied directly to the speed at which the bytes will come through because of those extra start and stop bits. There are more than eight bits per byte. There is also a gap between the end of one byte and the beginning of the next, slowing transmission down even further.

With the right software it's possible to transfer information or programs between computers, using the RS232, without the imposition of a modem. This technique is becoming particularly useful with the arrival of the lap-held computer, where the user can transfer standard text files from an applications program in one machine to an applications program in another. All you need is a cable with the correct plugs.

The trouble is that finding the right plugs is not as easy a task as it might sound. Although RS232 is supposed to be a communications 'standard', the configuration of the pins on RS232 cables varies from machine to machine.

This has led to the development of a market for 'smart cables' and 'suss-boxes' which help you to get machines with different cable configurations talking to one another easily.

## **ACOUSTICALLY COUPLED MODEMS**

There are two basic types of modem available: one plugs directly into the telephone system via a wire and the other simply fits over the telephone handset. Each of these modems has its own particular strengths — and weaknesses.

The modem with acoustic coupler has the advantage of being totally portable. This makes it particularly convenient to use in conjunction with luggable or lap-held micros. The coupler simply consists of a 'reverse' telephone handset. The microphone in the mouthpiece of the handset is coupled to small speaker and the speaker in the earpiece is coupled to a microphone in the coupler.

Obviously, the coupler can be used with any telephone, but

there are two disadvantages. Because it's coupled acoustically there is always the chance that background noise will creep into the transmission causing garbage to appear on the screen at odd moments. This can be reduced somewhat by a rubber wrap-around on each coupling to reduce the noise. But this brings disadvantages of its own as it means that every time you want to communicate you have to fiddle about coupling the two items together — a frustrating process at the best of times.

But this method does have the distinct advantage of solving the isolating problem. When you are connecting an electrical appliance like a computer to the telephone system, the people responsible for the telephone network (in our case British Telecom) are understandably concerned to ensure that there is no chance of a short circuit occurring in the computer or the modem, which will send a high-voltage current down into the delicate switching systems at the exchanges.

An acoustic coupler ensures that the two systems are completely isolated.

## **HARDWIRED MODEMS**

The second and probably best type of modem is the directly coupled or 'hardwired' one. This hooks directly into the telephone system, but don't be misled by the 'direct' terminology. As always, the part of the modem running off its own power must be completely isolated from the telephone system somehow. On the direct modem this is usually done through an LED system.

But to the person using it 'direct' is exactly what it is. These little modems have become very cheap, with several on the market costing under £100. You don't have to worry about connecting them up to your telephone every time you want to use them and you don't have as much trouble with background noise.

Many hardwired modems use the new Telecom standard wall plug arrangement — with the incorporation of a double plug adaptor for your wall socket you can have your normal telephone and the modem plugged in and ready to go at the same time — convenience should not be underestimated.

Another advantage of this sort of modem is its facility to

'auto-answer' or even 'autodial' a number — though you will always find that facilities like these up the price of the products quite considerably.

Telecom regulations are an important factor in this field. Always ensure that the modem you are about to purchase has been Telecom approved. Although it's not an offence for a dealer to advertise a non-approved modem, and it's not an offence for you to buy it, you are liable if you hook it up to the telephone system.

This situation is complicated by Telecom's approving individual components, so advertisements you see are likely to make mention of 'Telecom approved components' — not actually of interest to the average buyer. The assembled product is the item which must be approved if it's to be of any use to you.

The problem is that the discrepancy in speed of the micro industry and the speed of the British Telecom in approving make things very difficult for distributors — BT has just reduced the time needed for the approval procedure to three months.

In fact, BT has also off-loaded direct responsibility for approval of modems to the (BABT) British Approvals Board for Telecommunications — which is hoping to speed up and slim down the approval process (Monitor, issue 52).



**Micro-Myte's 160 IQ/D** The Micro-Myte 160 IQ/D is a software-controlled acoustically-coupled modem for the Sinclair Spectrum which uses the cassette port, rather than the more standard RS232C serial interface.

It can't be used to communicate with ordinary bulletin boards or electronic mailboxes, but is instead designed to allow easy quick transfer of information between Spectrums.

The Micro-Myte transfers data at the non-standard rate of 1032 baud, instead of the 300 baud speed used by most low-cost modems.

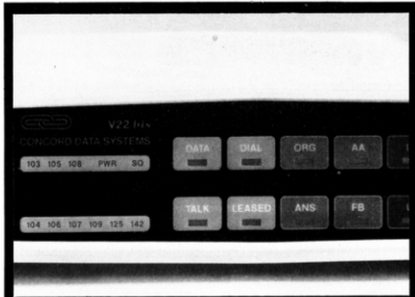
But at the price of only £99, the 'non-standardness' of Micro-Myte's modem may not — in the end — matter.



**Sendata 700B series acoustic coupler** This is a truly portable 300 baud modem. The acoustic cups on either end of the modem mean you can use it with almost any phone and the rechargeable batteries mean you don't have to look for a mains plug before you start transmitting.

It's just a little more expensive than most acoustic couplers costing between £220 and £280 (depending on whether you buy it from Sendata or Tandy). And, of course, acoustic couplers that are cheaper aren't portable.

Of course, if portability isn't important for your communications, then you'll probably be just as happy with a cheaper — but more stationary — conventional hardwire or acoustic modem.



**Concord's V.22 Data Modem** At £547, the Concord V.22 is at the upper end of what most people would be willing to spend on a modem — but it's also at the upper end of capabilities.

It's a hardware affair that runs at 1200, 600 and 300 baud and automatically filters out distortion on the line. The modem also auto-answers calls from other computers and, when it detects the call, analyses its signal and selects the appropriate baud rate on its own.

The system can be run manually if you don't like the idea of your modem answering your phone calls every five minutes. (Some modems — which are equipped with a device that detects whether a human voice or computer tone is calling you — can be run all the time.)

The V.22 seems to be a comprehensively equipped, if somewhat expensive, device.



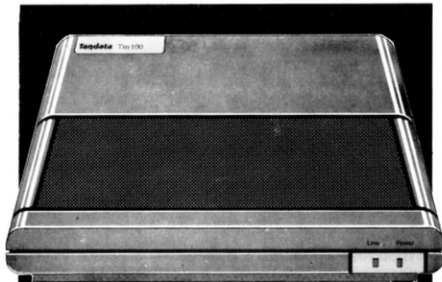
**Maplin's modem** This modem, which you put together from a kit, is the cheapest way to get into telephone communications.

At only £39.95, it uses the standard 300 baud CCITT system to communicate over the phone lines and runs at either half or full duplex. Maplin also runs its own mailbox and electronic mail service which lists much of the information in their catalogue and gives you the option to order it through that service.

Connection to the computer is via a standard serial RS232C interface — and if your computer doesn't already have one, Maplin do a number of such interfaces for the Dragon, the Vic-20, Commodore 64 and the Sinclair ZX-81.

The modem has indicator lights showing when it's receiving, transmitting and locked.





**Tandata's TM100** The TM-100 is yet another modem to sell for under £100. The shape of this £99 modem is not dissimilar to an Oric-1 computer with no keyboard, but it is capable of 1200/75 transit and receive on full duplex can store up to eight telephone numbers of up to 16 digits each. Passwords and log-on identifiers for each of those phone numbers can also be stored on the TM100.

You can automatically or manually transfer your ID, and you can change the ID and passwords currently stored in the modem. If you're using the modem by yourself and few others are likely to need to use it, you're probably safe leaving all the identifiers stored in the modems.

The modem is connected easily to any micro with an RS232C serial interface and connects to the phone line through a 600 series modular jack plug.



**Dacom's Buzzbox** At £69.95 this is probably the cheapest hardware modem available (unless you count kit-based modems you have to build yourself).

It's small, compact, easy to use and connects to any micro with an RS232C standard interface. The Buzzbox runs at only 300 baud (send and receive), but since that speed is used more often world-wide than any other, this shouldn't be a drawback. It's lightweight and plugs easily into a BT modular jack or the old 420-type and can run either on batteries or the mains though the battery-operated version might cost you a bit more.

There are only two switches, one which switches the phone back and forth from answer to originate and one which lets you use the phone for either talking or transmitting data.



**Minor Miracles WS 2000 World Modem** This is one of the first of a new breed of international modem that runs on both the North American and British phone systems. Though the Minor Miracles modem does not have British Approvals Board for Telecommunications approval, the components in the modem are approved. It is not illegal to own one, but attaching it to the telephone system is...

The specifications for the new modem are impressive; it operates at 300 baud full duplex, 1200 baud send/75 baud receive full duplex and 1200 baud half duplex. It recognises European and American protocols and an auto-dial/auto-answer plug-in can be bought for an extra £39.

The Minor Miracles modem is hardwired and plugs straight into a standard British Telecom phone jack.



**Pace's Grapevine Modem** Pace has produced a new modem to rival the Minor Miracles WS 2000.

For £125, the Grapevine will allow you to run 1200 baud receive, 75 baud send and 300 baud standard at full duplex. It offers CCITT (European) and Bell (USA) transmission frequencies and a self-test mode. The fact that it's hardwired, like the Buzzbox and Minor Miracles modems, minimises the risk of noise on the line interfering with and corrupting data.

The Grapevine sports an integral power supply and uses a 5-pin DIN connector for interfacing with standard RS232 ports on micros.

It comes standard with a lead suitable for connection to the BBC Micro, but Pace has said it will supply leads for other machines on request.

# PHONE TO TERMINAL

**T**here is a disturbing amount of jargon and constraints that come between you and getting to grips with using a modem to communicate.

Most of the trouble stems from standards — it's not that there aren't any, but that there are so many. It's all a question of setting the right speed, the right number of start/stop bits which surround each byte of data you send or receive.

Then there's duplex and parity. Standards demand ensuring the receiving machine expects the same sort of data at the same rate that the sending machine is dishing out. Thankfully, the actual course for the characters which are sent are fairly standard.

Just about everything which communicates electronically uses a standard ASCII code. A is sent as 1000001, B comes out as 1000010 and so on up through the alphabet. But to send information you have to know if the receiver is expecting an odd or even parity.

That's an easy one, you might say, the standard should be even parity. What could be easier — even parity for nice even data transfer? Not at all. Some systems are configured to accept odd parity. So before you can communicate you have to set your system to the correct parity.

Every byte sent has an eighth bit which helps the receiving device check the integrity of the data at the other end.

All characters are sent as numbers, which are, of course, odd or even. The parity bit is added to the number to make it odd or even — depending on what the receiving machine is expecting. If the status is even parity any character which has an odd number is given a parity bit of 1 to make up the difference, and vice versa if the character is already even it gets a 0 parity bit. Thus, if the receiving machine receives an odd number it can be sure when one of the bits is wrong.

The concept of duplex is also complicated. Full duplex means communicating modems can receive and send simultaneously. They do this by sending and receiving on different frequencies, and they do it because it makes a good error check. In full duplex it's obviously a very fast process.

Half duplex means the communication is two-way, but not simultaneous, so you're not getting a check back on what's appearing at the other end.

Perhaps the most obvious variation is speed, or baud rate. Baud means the number of modulations per second. All this is excusable because transmission speed is a trade-off between speed and safety. The slower you send data over a telephone line, the more sure you are there's not going to be a breakdown in communication. The variables are large.

Firstly, there is a wide variance in the quality of the line you happen to be using at any one time. Remember the last time you had to scream down the telephone to make yourself heard. You might be able to cope with that sort of aggravation, but computers can't.

Problems of garbage appearing on your screen are certainly not unknown. So, when in doubt, the first thing to do is slow it down. Some of the cheaper modems like the slower speeds. Against this, of course, is the argument of time and money. The 75 baud rate is appallingly slow and a large document costs several minutes in telephone charges.

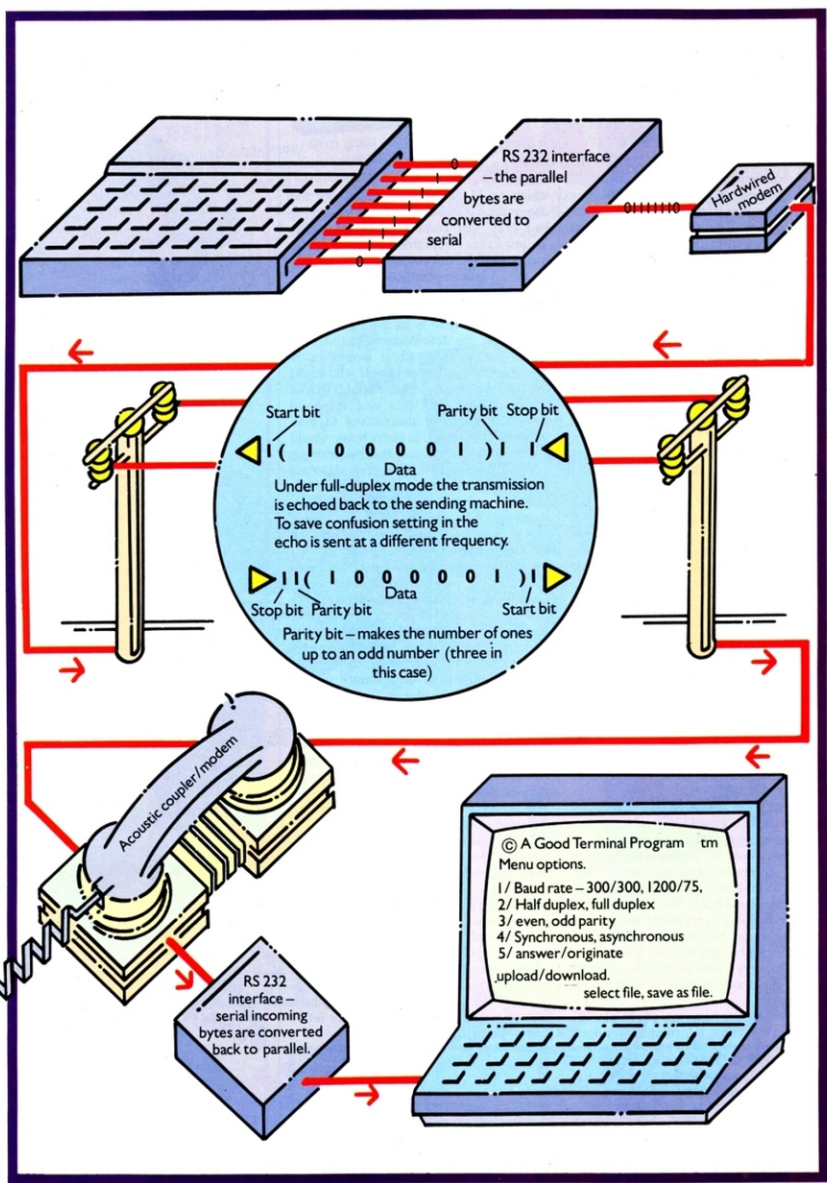
These days a firm favourite is 300 baud transmit/300 baud receive — henceforth termed 300/300. The other common speed is 1200/75, which is the speed used by Prestel. You're also likely to come across 600 or 110 from time to time. When you communicate with another computer you are effectively turning your machine into a 'terminal' to receive and send information.

In the commercial field terminals are used a lot to interact with mainframe or minicomputers. The terminal may be in the same room or miles away from 'the computer, in an airport for instance. These terminals can usually be split into smart or dumb terminals. A dumb terminal lives up to its name. It has no local facilities. It sends each character straight to its host as it's typed and has no way of retaining information sent to it — the moment it scrolls off the screen it's gone for good. A smart terminal, on the other hand, is assumed to have local capabilities. It can store and buffer ingoing and outgoing information.

A micro is really an over-qualified smart terminal but its potential can only be realised with the incorporation of a good 'terminal' program. This is an applications program which should enable you to easily set and store all the variables mentioned above — parity, baud rate and so on. So, if you're in the habit of accessing a variety of remote systems, you can store all the communication variables in the terminal program and call it all up at the appropriate time.

Some terminal programs, given the right hardware, even dial the number for you. As well as dealing with all the slog, a good terminal program enables you to easily save text and strip out unwanted control characters ready to insert in another applications program file. You should also be able to prepare text for transmission.

Some programs, with the right computer in tow, will allow you to define keys for such things as passwords or frequently used keystroke sequences required by the system or systems you are accessing.





## FUTURE PLANS

The future of computer-based communications is still very much an open question. There are futurists who confidently predict the advent of 'a micro in every home' within the next five years, while others stubbornly hold on to the idea that computer communications are largely going to be a big business concern and won't have much bearing on the home user.

You can already buy a cheap modem and computer that opens up many large international mail and database facilities for under £200, but so far the incentive has been small and the 'on-line' cost still relatively high.

One thing that might well reverse that trend is the heavy involvement of telephone companies in micro communications. It should come as no surprise that telephone companies are at the forefront of electronic communication, but it might surprise you to learn that some telephone companies are already working towards finding a cheap way to put a micro in every home — as a cost-saving measure.

The key to this cost-saving is the annual printing of telephone books. Each year, phone companies all over the world must print and distribute new telephone books to all their subscribers. And in cities such as London — where the telephone directory runs to four volumes — that kind of printing isn't cheap. Some of that cost is off-set by the rates charged for listings in the Yellow Pages, but electronic communication offers a much cheaper way forward.

Canada's BC Tel corporation has been looking at the possibility of equipping every home with a cheap communications micro that would allow people to phone up a huge computer database when they wanted to look up a number, rather than using a telephone book. The idea is that the cost of equipping every home with such a terminal would be quickly offset by not having to print new telephone books every year. Numbers would be added constantly to the database so that it was always current.

A good deal of money would also be saved on operator information services,

which could be largely handled by the computer database, even numbers which had only just come into service. The Yellow Pages would still spin money in the form of full-screen colour advertisements on the telephone terminal which could be charged according to how much storage 'space' is used on the service.

In the UK there is an even greater incentive for the development of this kind of service. First of all, it would vastly increase the number of people who could use British Telecom's Prestel and BT Gold communications services and it would provide less costly alternatives to mail delivery. A terminal in every home would give most people an easy facility (with the addition of some form of keyboard) to use electronic mail, and would both speed up and reduce the cost of business communications.

BT Gold and the new One-to-One electronic mail services are already looking toward this future by using electronic mail with existing non-electronic technology. On both services you can now send telexes and telemessages via your micro. Telexes feed the text generated by your micro to a larger computer system which puts them into telex format — from which they can then be printed out on standard telexes throughout the world.

Telemessages are a slightly different mixture of old and new. You type a message out on your micro with a name and address at the top of it. That message is then printed out by BT or One-to-One on a standard line printer in their offices and the printed message is stuck in an envelope, addressed, stamped and posted.

Large-scale use of communications facilities on micro will eventually make the need for such mixtures of old and new unnecessary — but for now they are useful in introducing people to the power of the new communications technology. The future will probably look something like this: you'll send your electronic mail message to a large storage device which the recipient can then ring up and read the messages from. Collecting mail will no longer be a matter of going to the doorstep or letter box — just dial a number.

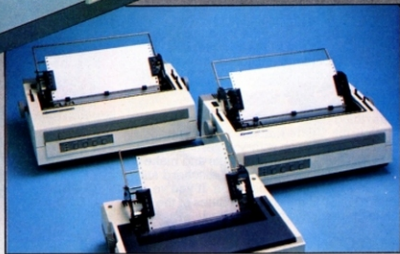
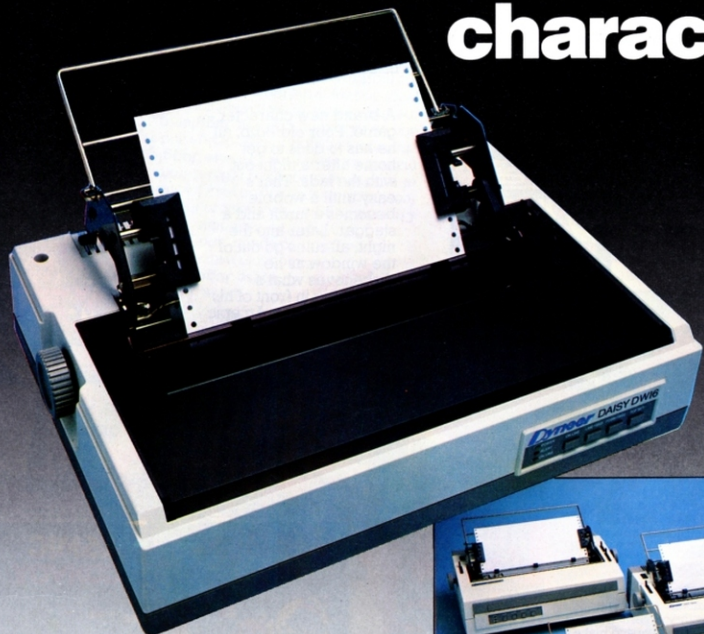


**Micropaedia Editor:** Goef Wheelwright  
**Design:** Nigel Wingrove  
**Contributors:** Kenn Garroch and Ian Scales

### NEXT WEEK

We conclude our look at communications with a detailed comparison of electronic mail and bulletin board services.

# Dyneer: Daisies with perfect characters



**T**HE DYNEER DW16 – pictured above – offers Daisy-Wheel-Perfect print at a price you'll find difficult to believe.

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optional automatic cut-sheet feeder for users needing maximum correspondence throughput.

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# Taskset & commodore

We're only writing games, and we're only writing for the 64. Rely on us to bring you the greatest games, the greatest concepts and the greatest value.

## GYROPOD

The complete deep space saga. A radical joystick action can bring inspired flexibility and a horrific kill-rate. The outstanding graphics include highly detailed craft and lots more than eight sprites at once. A full music and effects sound track accompanies the action. All these features combine with player options and a top 20 hi-score table to set new standards in hi-tech slaughter.



## BOZO'S NIGHT OUT



A brand new character game. Poor old Bozo, who he has to do is to get home after a night out with the lads. That's easy until a wobble becomes a lurch and a stagger. Later in the night, all rules go out of the window as he disbelieves what's happening in front of his blood-shot eyes. An epic journey with ultra-smooth graphics and sprites which run rings round normal games.

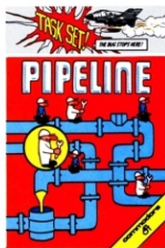


## SUPER PIPELINE

Keep the pipeline open. Foreman Fred and Plumber Pete have their work cut out. The evil ladderman drops metal wedges to plug the pipeline – and only Pete can fix 'em. Pete trusts Fred to defend him against the six-legged Venusian pipe spiders and the hard case lobster while he knocks out the plugs and restores the flow. Full accompanying music and effects, options and hi-score table.

## JAMMIN'

Unlike anything else, a totally musical game yet highly colourful. Guide Rankin' Rodney through the top 20 mazes – each with an interactive rock sound track. Gather the instruments and make a band but watch out for bum-notes, dischord and that most deadly effect – distortion. If you've never heard the full music capabilities of the 64, grab an instrument and join the band.



## COSMIC CONVOY

Just surviving is not good enough in this giant convoy. Control three fighters at once, to defend the huge transporters as they play between the planets. Only those transports reaching planetfall will gain galactic credits, and no-one expects promotion for losing the

entire fleet. Which freighters must be sacrificed to get most cargo to the next planet. Full sound options and hi-score table complete the arcade package.

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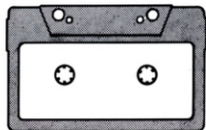
Selected titles available from:  
W H Smith, Boots, Menzies and all good computer stores.

Major distributors include  
Microdealer UK, Websters, Centresoft and P.C.S.

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## COMMODORE 64

## Bells and belles

**Name** Hunchback System  
**Commodore 64 Price** £6.90  
**Publisher** Ocean Software,  
 Manchester, 061-8329143 **Format**  
 Cassette **Language** Machine code  
**Other versions** Spectrum, Atari,  
 Vic-20, Electron, Dragon and Oric  
**Outlets** Retail, Mail order.

If you go down to the woods today, it's the keeper of the bells you encounter, not teddy bears. A combination of running and bouncing will take you to the next bell and up a level until you rescue the fair damsel Esmeralda.

## Objectives

You must rescue the imprisoned Esmeralda from the castle stronghold. To do this you must scale the castle walls, jump over the fireballs, avoid the pursuing knight, swing over the pit and other openings and ring the bells along the way.

## In play

The game loads in the usual way (SHIFT & RUN/STOP). The title page is a demo of Quasimodo's quest which, along with the introduction, is accompanied inexplicably by the strains of 'Teddy Bears' Picnic'. There's an option of instructions, and choice of keyboard or joystick. Both are equally responsive and it is refreshing to have a choice of controls.

Once the game has been started Quasimodo has to run and jump along the ramparts avoiding the fireballs. To com-

plete the first level you must ring the bell and the game moves up a level. The second level is completely different and a great deal more tricky. You must swing across a pit on an ever-swinging rope. The difficult part is getting off the rope safely.

The third level is more jumping over ramparts. While this is going on, Quasimodo is being chased by a knight. The game gets more complex at each level, and it requires a good deal of thought and strategy on some levels as well as rapid reactions and reflexes. Level five has fireballs coming from both directions and arrows as well, with the knight still pursuing you steadily.

Hunchback has 15 levels of play, before you rescue Esmeralda on completion of the last level. My five lives always seemed to expire on the fifth level. Hunchback displays the current score and number of lives left along with the bonus score which is awarded for losing no lives. There is also a high score table for those who can play well.

## Verdict

The glossy advertising on the package was spot on in the case of Hunchback. It is good fun and exciting, albeit very frustrating. The use of sprites is excellent, as is the use of sound and colour.

Kevin Bergin

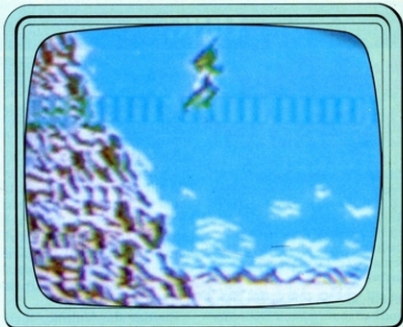
**RATING** (/5)

**Lasting appeal**

**Playability**

**Use of machine**

**Overall value**



## Before sun-up

**Name** Aztec Challenge **Price**  
 £12.95/£8.95 **System** Commodore  
 64 **Format** Disk/cassette **Language**  
 Machine code **Publisher** Audiogenic  
**Other versions** None **Outlets** Retail

The scenario for Aztec Challenge is 1500 AD! You've been sentenced to death, but have one chance to escape. If you don't want to end up as the next sacrificial victim to the Sun God, you'll have to have a go at meeting the challenge.

## Objectives

There are seven levels, each with its own problems. Obviously you have to get as many individual achievements as possible and lose as few lives as you can. You can score ten points for each achievement and if you ever reach the outside without losing a single life, there are 1000 points — lose four lives and that's reduced to a paltry 200.

You get five lives to start with, but if you lose them all you simply have to start again — so what happened to the death penalty?

## In play

This is a joystick-only game and has a two-player option.

The seven levels involve rather different scenes, the first being the Gauntlet, where two rows of spear-toting Aztecs will try to nail you before you can make it to the temple. I went on here for a long time and was beginning to feel it was all a bit too difficult. Then, as the music changed, the temple grew nearer and a door appeared, I was completely hooked.

Next came the stairs up the face of the temple which you have to climb. It's not an easy task since stone blocks keep falling on you. To actually enter the temple you have to get through a long hallway as fast as possible. Just to add a bit of interest to this stage, spears or stones are likely to plunge into your cranium from the ceiling, spiked traps suddenly rise from the floor, or trapdoors open before you. This is where most players will peak out for a long, frustrating time. It's far harder than it sounds and as soon as you've cleared one danger, another appears — there's no respite.

Should you reach the dungeon, you'll no doubt have a laugh or two over the vermin. It's not a good idea to let the beasts bite you. To get out of the temple your task is to cross the tiles, hopping from one to another, to reach the door out. Next come the piranha in a lake which you're bound to attempt to cross, whence onto the bridge and even then you're still not free. There are another three phases and I got nowhere near level seven.

## Verdict

Aztec Challenge has excellent colour graphics, good sound and it's the sort of game that keeps you wanting to go back to it to better your score — let alone get through the lot successfully. It's a refreshing change and a novel idea compared with many games at the moment.

Nevill: Ash

**RATING** (/5)

**Playability**

**Lasting appeal**

**Use of machine**

**Overall value**







ORIC

Defender dependant

**Name** Defence Force **System** Oric  
**Price** £7.95 **Publisher** Tansoft, Units 1 & 2, Techno Park, Newmarket Road, Cambridge Tel: (02205) 2261/2/3/4 **Format** Cassette  
**Language** Machine code **Other versions** None **Outlets** Mail order and retailers

There are good space games and bad space games. Defender is still one of the best and is justifiably emulated on many micros. Here's the first version for the Oric, and its good enough to be the standard to beat.

Objectives

Flying your multi-directional space fighter, you must defend the helpless humanoids against capture by 15 different types of marauding alien.

In play

By far the best cassette I've ever seen, the game has an attractive cover, crystal clear loading instructions, captioned pictures of all the 15 aliens, and game rules which are exceptionally well laid out.

The game starts with a colourful title sequence. Options are there to suppress the sound effects, display the Hall of Fame, play a beginner's game or get straight into the action.

Against a starry backdrop and above a mountainous terrain, you pilot your ship through the sky. Technicolour laser beams burst from the ship every time one of the sensibly placed movement-control keys

is pressed or released. At the top of the screen, beside the large scoreboard, is a radar screen indicating the approach of the enemy. Humanoids fall from the sky then stay put where they land. Vulture-like aliens, Vultrae, will try to abduct the humans—they must be shot down before they reach the top of the screen. When all humans are captured, the game transfers to an astral plane where all the enemy turn to wraiths.

Besides the Vultrae, there are 14 other types of aliens zooming across the screen. Contact with any of these (or a human) results in the destruction of your ship (you have two spare). A shield button gives temporary respite from enemy bombs—the screen turns blue while the shield is active and to red when the shield's power is about to expire.

There are 20 waves to contend with, each one harder than the last. Wave 20 contains a Cybotroid, quite the worst of the foes you come up against.

The ship responds immediately to the keyboard but firing puts a strain on your fingers—there's no repeat fire mechanism.

Verdict

A colourful, testing game with great sound effects. Definitely one for the collection.

Bob Chappell

**RATING** (/5)

**Lasting appeal**

**Playability**

**Use of machine**

**Overall value**



Hitchcock hysteria

**Name** Psycho II/Psycho III **System** Oric **Price** £5.95 **Publisher** L. A Software, 75 Suffolk Road, Gorleston-on-Sea, Great Yarmouth, Norfolk NR31 7AL. Tel: (0493) 600426 **Format** Cassette  
**Language** Basic **Other versions** None **Outlets** Mail order

Fans of Hitchcock's famous movie, Psycho, and its current sequel, Psycho II, will be pleased to hear they can now play two adventures which star that less than lovable homicidal maniac, Norman Bates.

Objectives

Psycho II (The Adventure) has you searching Norman's old house for hidden jewellery. Unfortunately Norman has chosen this day to escape from the hospital where he has been incarcerated for the last 15 years. Guess where he's headed?

In Psycho III (The Revenge), Norman has locked you in an apartment and wants to play a little game. You must escape from the locked room, find a hidden bullet and shoot Norman before he gets bored and decides to dice you.

In play

The adventures are mostly text, with the addition of one or two pictures and some creepy sound effects (footsteps, dramatic chords, a chainsaw!). Input is by the usual method of verb and noun with some deviations eg OPEN GREEN DOOR. GO BACK. There are no help, save, score or inventory features and it will take a bit of

experimenting to find an acceptable command in any given situation.

Some of the puzzles are quite hard and chances are you'll be killed off quite a few times before eventually succeeding.

In Psycho II, Norman pops up from all sorts of places and is always carrying something sharp—knife, meat cleaver, or the dreaded chainsaw. At least you soon get to know which doors, cupboards, shower curtain, etc not to open.

Psycho III is different in this respect. You know Norman is on another floor but he likes to keep in touch by suddenly appearing larger than life (and twice as nasty) on the TV screen to warn you he's getting something impatient with your progress and so may terminate the fun.

The two adventures are not very broad in scope but what they lack in number of locations and flexibility, they doubly make up for in thrills. The textual descriptions are nicely atmospheric—when Norman gets you, the screen aplys turns red, the sound sends a chill up your spine and the text graphically depicts what Norman is about to do to you.

Verdict

Best played alone late at night to get the full impact. Although they are a bit inflexible, the games are hugely enjoyable. Some tough puzzles and chilling text— not for the squeamish.

Bob Chappell

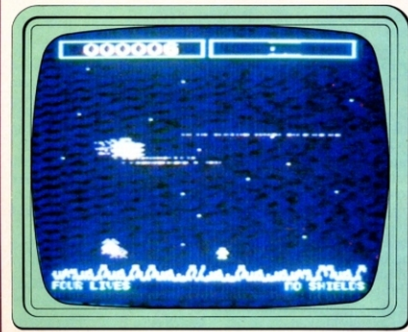
**RATING** (/5)

**Lasting appeal**

**Playability**

**Use of machine**

**Overall value**



## SPECTRUM

## Working up a lava

**Name** Volcanic Planet **System** 16K/48K Spectrum **Price** £6.95 **Publisher** Thorn-EMI, Upper St Martin's Lane, London WC2H 9ED **Format** Cassette **Language** Machine Code **Other Versions** None **Outlets** Spectrum retailers

Thorn-EMI have spread their wings and extended their activities into the Spectrum market with the release of a game of maze-running and bug-bashing.

## Objectives

You must plant a Plasma bomb deep in the bowels of the underground metropolis on the Planet Zeron. The bomb, when detonated, causes a volcanic eruption which will destroy the city — you, too, if you're still in the vicinity

## In play

The game can be played with

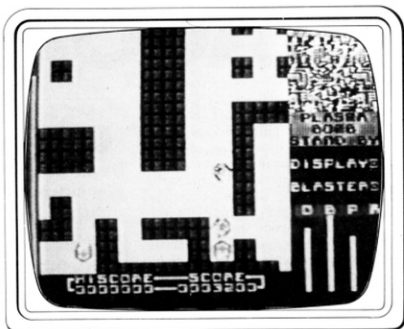
joysticks or keyboard and any of five skill levels may be selected. Most of the screen is taken up with an aerial view of part of the first level of a red-bricked city.

On the right-hand side of the screen are a number of aids. One is a small hi-res map of the whole level — a magenta marker shows your current position. When you are getting close to a lift (which will transport you to another level) the marker turns blue.

As well as Plasma bomb and weapon status indicators, there are four bars giving the state of your life-support systems.

Moving off the edge of the display causes the screen to scroll, revealing more of the metropolis. You are represented, unexpectedly, by a black tarantula-like creature while the Zeroners are scuttling, purple crabs, they are more numerous than ants on a picnic and will immediately start firing. You can fire back but only in the direction you are facing.

Hunting for a lift is aided by



the hi-res map but takes time. Power and oxygen can be replenished by moving over one of the power packs and oxygen bottles lying around the city.

On the lowest level, you've got to find the volcanic plug, a black shape with a glowing centre. Prime this and get the heck out of there — the bomb has a short fuse! When it explodes each floor fills with lava — you've got to make it to the top before it catches up with you.

## Verdict

The plot is original and while the graphics are not stunning, they are good enough. There are no sound effects. Being set a finite mission gives the game an added zing.

**Bob Chappell**

## RATING (5)

Lasting appeal



Playability



Use of machine



Overall value



## Make the most of your micro with these two new books

## COMPUTING WITH THE ORIC 1

Ian Hickman

This new book is for all users of the Oric 1 micro. It complements the Oric Manual and can be used alongside it. An introductory section covers the initial switching-on and setting-up and is followed by some simple BASIC programming. Later chapters introduce more advanced BASIC, high-resolution colour graphics, the sound feature and interfacing, with a special section on the printer and another on machine code programming. A number of original programs are included in this practical guide.

Softcover 160 pages 0 408 01444 X £6.95



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# DRAGON DRAWER

The Animator is just what the name says: it's a graphics package which allows you to create your own animated graphics for use in games, or on their own. The package gives the Dragon sprite facilities something like those on the Commodore 64 and Atari. With this package you can define your own sprites and incorporate them into fairly sophisticated animation routines. At least, that's the promise.

## Documentation

Supplied with the cassette is a badly printed 36-page booklet. It looks rather tatty and is liberally sprinkled with spelling mistakes. It's far from clear, I got lost at two points during my first routine.

## In use

First you load the sprite generating routine. You use this to draw two different classes of sprite — principal and secondary — and save them on tape. Next you have to load the animator program from the other side of the tape. The movement of the principal sprite and up to 24 secondary sprites can now be set up. Once defined, you save this information on tape. Now is the time to write a program in Basic or machine code which uses the animation. The program can be a whole game or just sufficient to load the program off tape and run it.

The package is rather clumsy to use with too many separate steps involved in creating the final animation. The menus in the program don't always make clear what the next step is, so the manual has to be at your side at all times.

Responses are very slow during the sprite generating routine, causing much frustrated hammering at the keyboard.

You design the sprites using an oversize grid. As you fill in the grid a real-size sprite appears to one side.

Once drawn, the sprite can be manipulated — the colours can be inverted, the sprite can be reflected about the vertical and horizontal axes, rotated clockwise or anticlockwise, moved within the grid, or copied.

If you intend to use the second part of the program to animate the sprites you must follow the rather complicated instructions in the manual regarding how many copies of the sprite, and in what orientation it is to be on the screen before it's saved.

The animator program allows you to define how sprites will move. A starting point and the speed of movement can be defined for both types of sprite. The real difference between the two kinds of sprites becomes apparent at this stage — you can choose to use a joystick or cursor control keys to control the principal sprite's movement.

Once you've decided how the sprites are going to move they must be saved on tape,

## PCN PRO-TEST SOFTWARE

David Rosam studies a Dragon graphics package.



each under a separate file name.

Before you can examine the fruits of your labour you must write a program. The manual gives you the Basic code needed to read the animation files off tape, and then run them.

If you use the bare minimum of program lines you'll just see the sprites moving against a blank screen. Your program should, therefore, include all the information for drawing the background.

## Verdict

This is a very difficult package to sum up, it undoubtedly does what it sets out to do — you can create satisfactory sprite animations.

Unfortunately, that's not the whole story. If the package is aimed at 'the beginner' it's totally inadequate. The documentation is poor, the instructions unclear. The beginner will, after one or two failures, be able to produce satisfactory animations. I doubt it will be possible to go on to produce satisfactory games.

The animations are stored on tape in machine code, so you will have to know something about code concepts so that the sprites can have a role in a game.

There are also the problems encountered in use. The response of the sprite generation routine is appallingly slow. This has been acknowledged by Screenplay and the software uses the well-known Dragon speed POKE to liven up the response.

Unfortunately, not all Dragons will allow you to take this kind of liberty without crashing — there should be some warning supplied because some buyers are bound to be left scratching their heads about the mysterious crashes experienced when fast is selected.

If a PMODE is selected which links pixels into twos or fours, drawing a sprite can become slightly confusing because you can set the two halves of the pair to different colours. In the sprite itself they will have to be the same colour. You can finish drawing your grid only to find that the resulting sprite looks rather different.

I find it very difficult to recommend this package because it is so awkward to use, and because of the uncertainty about who will find it useful. This is a good idea that has been seriously marred by poor execution.

**RATING**  
Features  
Usability  
Documentation  
Reliability  
Overall value



Name Animator Application Graphics  
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Publisher Screenplay (041-248 2481)  
Format Cassette Other version None Outlets  
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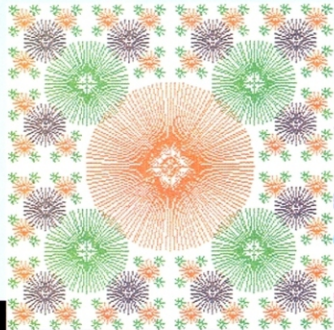
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# Working Knowledge

All work and no play would make John King a dull boy if not for this IBM PC tutorial package.

**K**noware is a cheap IBM PC tutorial package which helps the know-little become a know-all by playing games. It includes a variety of applications to get to grips with: they include a simple spreadsheet, a simple database and a basic, but adequate, text-editor.

The publisher says 'Knoware teaches the fundamentals of how to use a personal computer . . . it requires no prior experience, no manuals, no classes and very little time or money'. The key to this is the introduction of game-playing to adult education.

Some of the claims may be a little over the top; it's optimistic to suggest you actually learn about most of the important commercial computer applications. What you do get is reasonable exposure to tiny examples of business programs which may be enough to learn those packages' capabilities, but not to learn much about how to help them help you significantly.

## Documentation

The only real documentation is a small fold-out leaflet with 11 pictures and less than 200 words.

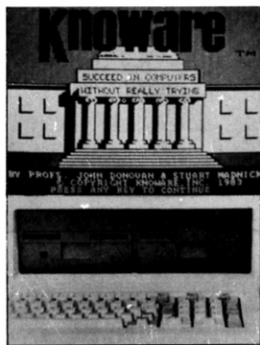
Nevertheless, it proved sufficient to give satisfactory and reassuring introduction to novices. Mind you, it's on such a small bit of paper that it could easily get lost.

## Features

The game takes you through seven levels of a company, from mail-clerk to company director. You progress up the career ladder by completing varied computer tasks.

The second part of the game invites you to invest what you've earned, to become a millionaire. This part of the program is not so well thought-out.

The tasks you have to master to rise through the company are summarised in the table; you'll see that each is an exercise in either programming (in Basic) or making use of an application. As mail



line (x,y)-(x,y), to draw a vertical line to prevent the thief leaving. The animation is written in assembler and it's an amusing exercise. Next, the task is made harder; you must trap the thief between two vertical lines.

The accountant's task is to select the best investment from a number of choices. That is, attain the greatest growth from a given investment with the minimum of risk. You have access to a simple spreadsheet/database that allows you to enter data for various investment possibilities and on which to base your judgement.

As the EDP manager you enter personal details in a personnel database, make amendments, find records and so on.

## In use

The game is screen-driven and impossible to crash, there are a few petty weaknesses; for instance, you have a working life of 60 years; and few of us expect to work for more than 45 years. Other niggles are that the rate of passing time accelerates as you

be nice to be able to bypass some of the menus and screen-chat at this stage.

Though some of the tests are helpful so far as they go, inexperienced users would find them too limited compared with a real tutorial program. For instance, despite the mostly adequate help facility, it was difficult to find which particular spreadsheet formula was required as an answer. Spreadsheet formulae can take a variety of equally valid forms and in some cases it was possible to bluff the program into believing incorrectly that a question had been dealt with properly.

The program works deliberately slowly throughout, tediously so at times. However few people will need to run it often enough for this to be a problem.

A major difficulty is caused by using an ordinary green monitor. On a number of occasions highlighting and shading make messages difficult to read, sometimes unreadable. There is, however, regular use of high quality line graphics with American musical accompaniments at each level of promotion. At odd intervals you come across painful puns and humorous interjections. For example, the database contains a variety of showbiz stars.

## Verdict

Newcomers to personal computers will gain greatly from playing this game. It's difficult to assess the value of the application for genuine day-to-day business use, but I don't really believe the applications provided will be adequate for serious use.

On the other hand, Knoware offers a cheap way to get, at the very least, a limited set of introductory applications. It's quite possible for Knoware to encourage novices to use computers.

Knoware is sure to move a player towards a preference for menu-driven software and Visi-clone spreadsheets. It should be worth watching out for future versions as well as the extension of its approach in other areas of micro computing.

## RATING (5)

**Features**  
**Documentation**  
**Usability**  
**Performance**  
**Reliability**  
**Overall value**



### Position

Mail clerk  
Accountant  
EDP manager

Public relations director  
Personnel Director  
Vice president  
President

Chairman

### Activity/Problem

Graphics; line drawing  
Investment appraisal and analysis  
Modification of a short Basic program

Database manipulation  
Text editing  
Spreadsheet entry and editing  
Multi applications usage for problem-solving

Fanfares and no more work.

clerk, you must stop a thief stealing the mail. The mail-room appears and a figure runs in, takes some packages from a shelf and legs it through the door. You enter a command in Basic, using the standard form

get promotion, and each job-level has only two tasks.

Make Chairman grade, and you can return to each level and do two more related tasks of greater difficulty. It would

**Name** Knoware **Price** \$95 **System** IBMPC/XT (128K min) **Publisher** Knoware Inc, 301 Vassar St, Cambridge, MA 02139 (617) 576-3821 **Format** Disk **Other versions** None **Outlets** Mail order/Retail.



Ape King is a game for the unexpanded Vic-20 from Richard Bulcock of Blackburn in Lancashire. Most people will recognise the style of the game and know what to do. For those who don't, you, the hero, have to go up the ladders and along the walkways to the gorilla at the top.

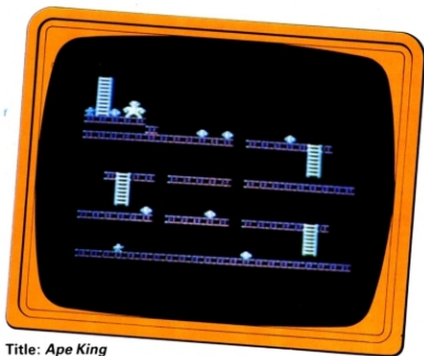
If you are using joysticks then jump over the barrels and holes by pushing the joystick up after turning to face the way you want to go. In order to climb the ladder, position yourself under the first rung and jump until the next walkway is reached. On reaching the gorilla the screen flashes, scaring the gorilla up another 25 metres. You get 50 points for jumping over a barrel and 500 points for reaching the top.

To convert the game to run from the keyboard put in the following alterations.

```
6 L=14: SC=0
22 IF PEEK(197) = (KEY FOR LEFT) THEN G=3: D=-1
23 IF PEEK(197) = (KEY FOR RIGHT) THEN G=4: D=1
24 IF PEEK(197) = (KEY FOR UP) THEN 100
310 IF PEEK(197) = (KEY FOR UP) THEN (REST OF LINE AS LISTED)
```

To find the keys to use, enter the following routine and run it with RUN 1000. Press the key you want for the direction. The number printed is the number that should be put into the appropriate line. Repeat this for right, left and up.

```
1000 PRINT PEEK(197): GOTO 1000
```



Title: *Ape King*  
Machine: *Vic 20* Application: *Game*  
Language: *Basic* Author: *Richard Bulcock*

```
5 Goto 5000 and set up user defined graphics and machine code routine for scrolling the barrels across the screen.
6 Set up variables, score, joystick pointers etc.
10 More variables.
15 Put man onto the screen.
20 Set up the tone register and read the joystick.
22 Check left.
23 Check right.
24 Check for jump (up).
25 Bumped into anything?
26 Fallen down a hole?
30 Don't step on character one.
35 Can't step off the edge of the screen at the start.
40 Make sound, rub out man

5 GOTO5000
6 L=14: SC=0: PA=37151: POKEPA,0: PB=PA+1: RB=PB+2
10 M=8144: C=30720: G=4: D=1
15 POKEM,G: POKEM+C,7
20 POKE36876,220: H=PEEK(PA): POKERR,127: B=PEEK(PB): POKERR,255
22 IF (RAND16)=0 THEN G=3: D=-1
23 IF (RAND128)=0 THEN G=4: D=1
24 IF (RAND4)=0 THEN 100
25 IF PEEK(M+D)=0 OR PEEK(M)=0 THEN 4000
26 IF PEEK(M+22)=32 THEN 4000
30 IF PEEK(M+D)=1 THEN D=0
35 IF M+D=8143 THEN D=0
40 POKE36877,0: POKEM,32: M=M+D: IF M=7818 THEN 4500
50 POKEM,G: POKEM+C,7: GOSUB3000: POKE36874,180
90 SYS828: IF PEEK(M+D)=0 THEN 4000
95 POKE36874,0: PORT=01050: NEXTT
99 D=0: GOTO20
```



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and update the position for reaching the top.  
 50 Put man back onto the screen with his colour.  
 90 Execute the machine code routine to move the man.  
 95 Turn off tone register low and delay.  
 99 Direction equals zero, continue the game from line 20.  
 100-135 Make the man jump.  
 300-340 Go up a ladder.  
 3000-3002 Start the barrels rolling?  
 4000-4550 End of game routine.

```

100 IFPEEK(M-22)=2THENGOTO300
101 IFPEEK(M-21)=2ORPEEK(M-23)=2THEN25
105 GOSUB3000
110 POKEM,32:M=M-22
111 IFG=3THENM=M-1:GOTO123
112 M=M+1
123 POKEM,5:POKEM+C,7
125 FORT=1T02:POKE36876,220:SYS828:POKE36876,0
126 IFPEEK(M+22)=0THENS=SC+50:POKEM+22,10:
POKE36875,200:F0RR=0T0100:NEXTR:POKE3
6875,0:POKEM+22,0
127 F0RR=0T0100:NEXTR:NEXTT
128 POKEM,32:M=M+22
129 IFG=3THENM=M-1:GOTO132
130 M=M+1
132 IFPEEK(M)=0THEN4000
135 POKEM,6:POKEM+C,7:GOTO25
300 POKEM,32
301 M=M-66:POKEM,5:POKEM+C,7
305 POKE36877,200:F0RT=0T0200:NEXTT:POKE36877,0
306 A=PEEK(PA):POKERB,127:B=PEEK(PB):POKERB,255
310 IF(RAND4)=0THENPOKEM,2:POKEM+C,7:M=M-44:
POKEM,6:POKEM+C,7:F0RR=0T0100:NEXTR:GOTO20
320 POKE36876,220:SYS828:F0RT=0T015:NEXTT:POKE
36876,0:F0RT=0T0100:NEXTT
330 GOSUB3000
340 GOTO306
3000 A=INT(RND(1)*L)+1
3001 IFA=1THENPOKE7795,0
3002 RETURN
4000 POKE36876,0:POKE36875,0:POKE36874,0:POKEM,5
4001 POKE36877,200:F0RV=15T00STEP-1:POKE36878,V:
F0RR=0T050:NEXTR,V:POKE36877,0
4002 F0RT=0T0100:NEXTT
4005 POKE36869,240:PRINT"SCORE"SC"ON LEVEL"
14-L:PRINT"TRY ANOTHER 25M."
4055 F0RT=0T02500:NEXTT:CLR:RUN
4500 POKE7818,5:POKE36876,240:F0RT=0T0200:NEXTT
:POKE36876,0
4501 POKE36876,190:F0RT=0T0200:NEXTT:POKE36876,0
4505 POKE36874,160:F0RT=0T0200:NEXTT:POKE36874,0
4510 F0RR=0T010
4515 POKE36879,25:F0RT=0T0100:NEXTT
4520 POKE36879,8:F0RT=0T0100:NEXTT
4525 NEXTR
4535 POKE7818,32
4536 F0RT=0T0200:NEXTT
4540 L=L-1:IFL<6THENL=10
4545 SC=SC+500
4550 GOTO10
4999 END
5000 PRINT"DONE MOMENT":POKE36878,15
5001 F0RT=7416T07524:POKET,0:NEXTT
5005 F0RX=0T087
5010 POKE 7168+X,PEEK(32768+X):NEXTX
  
```





5000-5020 Poke in the user defined character set.  
 5025-5034 Data for UDGs.  
 5036-5038 Poke the machine code for moving the barrels.  
 5040-5046 Data for the machine code.  
 6000-6035 Set up the screen display.

```

5015 FORX=0T087:READA
5020 POKE 7168+X,A:NEXTX
5025 DATA0,24,36,90,90,36,24,0,255,66,36,24,36,66,255,0
5027 DATA129,255,129,129,129,255,129,129
5028 DATA8,24,72,62,10,8,20,36
5029 DATA16,24,18,124,80,16,40,36
5030 DATA146,84,56,16,16,146,254,0
5031 DATA3,5,7,2,3,1,31,63
5032 DATA192,160,224,64,192,128,248,252
5033 DATA111,55,55,7,14,12,24,24
5034 DATA246,236,236,224,112,48,24,24,0,238,138,234,42,238,0,0
5036 I=828
5037 READA:IFA=999THEN6000
5038 POKEI,A:I=I+1:GOTO5037
5040 DATA173,115,30,141,139,30,169,32,141,115,30,162,14,189,138,30,201,0,208,8,157,139
5041 DATA30,169,32,157,138,30,202,208,238,173,152,30,141,5,31,169,32,141,152,30,162,0
5042 DATA189,243,30,201,0,208,8,157,242,30,169,32,157,243,30,232,224,19,240,3,76,104,3
5043 DATA173,243,30,141,98,31,169,32,141,243,30,162,18,189,97,31,201,0,208,8,157,98,31
5044 DATA169,32,157,97,31,202,208,238,173,116,31,141,225,31,169,32,141,116,31,162,0,189
5045 DATA208,31,201,0,208,8,157,207,31,169,32,157,208,31,232,224,19,240,3,76,171,3
5046 DATA169,32,141,207,31,96,999
5599 END
6000 PRINT"JIB":PRINT"IB":PRINT"IB":POKE36879,8
6005 POKE36869,255:PRINT"IBIFG":PRINT"IBIFHI"
6009 PRINT"AAAAA":PRINTTAB(5):"A"
6010 FORW=1T04:READS,F
6011 FORT=STOP:POKE36876,0:POKET,1:POKET+30720,2:POKE36876,200:NEXT
6012 DATA7834,7853,7946,7965,8054,8073,8164,8185
6015 NEXTW:POKE36876,0
6016 FORL=1T03:READS,F
6017 FORT=STOPSTEP22:POKE36874,0:POKET,2:POKET+30720,7:POKE36874,200:NEXT
6018 DATA7852,7918,7947,8013,8072,8138
6020 NEXTL:POKE36874,0
6021 FORT=0T04:READA:POKEA,32:NEXT
6022 DATA8060,8066,7950,7956,7846
6030 FORT=38T0200:POKE36865,T:NEXTT
6035 FORT=200T038STEP-1:POKE36865,T:NEXTT:CLR:GOTO6
  
```

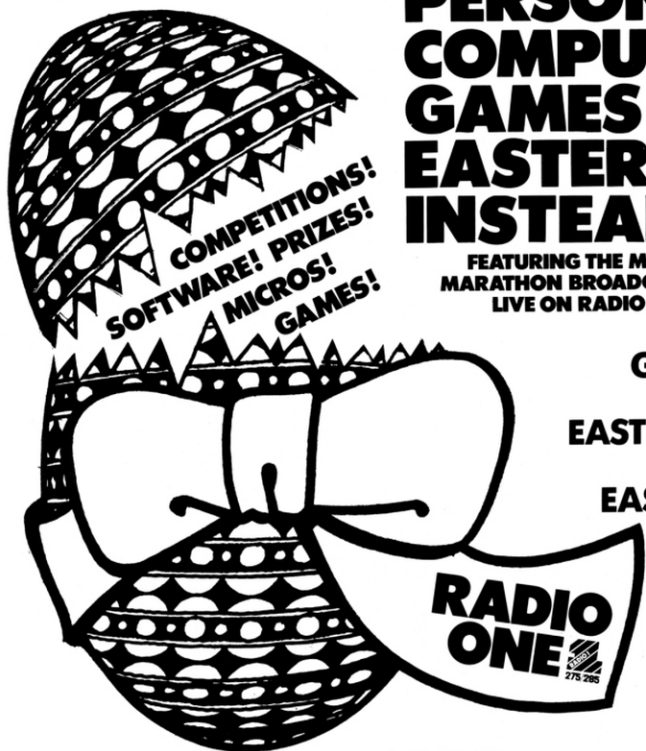




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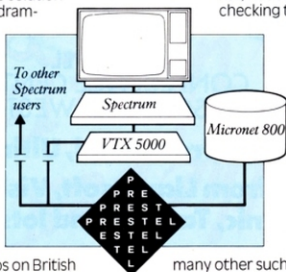
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# LYNX VAL

The Lync does not possess a very useful VAL (string) function, unlike other Basics such as some Microsofts and the ZX81, which will completely evaluate the whole string as an expression in terms of the current values of its variables. The Lync, however, will only return the value of the actual number at the start of the string.

Forexample: if X has the value of 10 at the time the function VAL("2\*X+5") is encountered, the Lync will return 2 while the ZX81 will return 25, the full evaluation of the expression.

The problem can nevertheless be overcome by placing the expression to be evaluated into a DATA statement, eg

```
10 DATA 2*X+5
```

and reading this data by:

```
RESTORE 10
```

```
READ Y
```

each time a new value of X is needed.

One practical use for this is in a graph plotting program that will take any function the user cares to supply. This kind of program is useful for displaying the shapes of various functions. The following program from Colin Clayman of Reading, will plot the graph of any function in X onto the screen, making the best possible use of the Lync's high resolution graphics.

**Title:** Lync VAL  
**Machine:** Lync 48  
**Language:** Basic  
**Application:** Utility  
**Author:** Colin I Clayman

```

20  DATA statement to hold
    expression; note that there
    are 80 spaces after the
    comma.
30-40  Set up variables.
50-440 Main loop
70-130  Input expression in X and
        the range of X.
150-180 Move expression to DATA.
190-260  Evaluate y for each point on
        the x axis and find the
        lowest and highest y values
        in order to lay out the screen
        neatly, allowing for small
        rounding errors around
        zero.
270-380 Draws the axes in green.
390-420  Plot the graph in white.
430-450  Awaits a keypress before
        either repeating or quitting.

10  REM GRAPH PLOT/1197
20  DATA ,

30  LET I=TRUE, Z=FALSE, Q=240, N=80,
    L=LCTN(20), E=1E-4
40  DIM Y(0), Y$(N)
50  REPEAT
60  LET I=INF, h=-INF
70  CLS
80  IF Y$="" OR Q$="N" THEN INPUT
    "Y=f(X)"; Y$
90  ELSE PRINT "Y="; Y$
100 REPEAT
110 INPUT "From X="; a
120 INPUT "To X="; b
130 UNTIL b>a
140 PRINT "Wait while I calculate the
    graph.", "Afterwards hit Q to
    quit,", ",", "or N for a new
    function,", ",", "or any other key for
    the same function."
150 FOR i=I TO N
160 IF i<=LEN(Y$) THEN POKE L+i,
    ASC(MID$(Y$, i, 1))
170 ELSE POKE L+i, ASC(" ")
180 NEXT i
190 FOR i=Z TO Q
200 LET x=a+(b-a)/Q*i
210 RESTORE
220 READ Q$, Y(i)
230 IF Y(i)>h THEN LET
    h=Y(i)*(ABS(Y(i))>E)
240 IF Y(i)<l THEN LET
    l=Y(i)*(ABS(Y(i))>E)
250 PRINT @ N, Q; Q-i; " ";
260 NEXT i
270 CLS
280 PROTECT MAGENTA
290 LET x=a/(a-b)*Q, h=h/(1+h)
300 IF x<Z OR x>Q THEN LET x=Z
310 MOVE x, Z
320 DRAW x, Q
330 PRINT @ x/2+I, Z; h; @ x/2+I, Q-10; l;
340 LET y=h/(h-1)*Q
350 IF y<Z OR y>Q THEN LET y=Q
360 MOVE Z, y
370 DRAW Q, y
380 PRINT @ Z, y+I; a; @ Q/23*
    LEN(STR$(b)), y+I; b;
390 PROTECT BLACK
400 FOR i=Z TO Q
410 DOT i, (h-Y(i))/(h-1)*Q
420 NEXT i
430 LET Q$=GET$, Q$=UPC$(Q$)
440 UNTIL Q$="Q"
450 PRINT @ FALSE, Q-10;

```

**PCN  
COMPETITION**

# WIN A LYNX

What is £299 and begins with L? *PCN*'s prize in our latest competition — in this case, the Lynx 96K. This version of the Lynx can run up to four disk drives, each of 250K, simultaneously using Lynx DOS.

Computers has already christened its other two Lynx machines — the 48K Leisure, and the 128K Laureate. Now the company wants you to name its 96K version. And if you name it, you can claim it as your prize. Just think of a suitable title beginning with L, and don't be bashful — let your imagination roam.

Entries will be judged by Computers in conjunction with *PCN* and the five best entries will win a 96K Lynx.

Fill in the entry form and send it to the following address to arrive no later than Friday May 11, 1984.

*PCN*, Lynx Competition,  
62 Oxford Street,  
London W1A 2HG



Name.....  
Address.....  
.....  
Telephone.....  
My suggested name is .....

Current machine; .....

I do/do not mind being included on mailing lists.

## DIAL-TEXT 50

TELETYPE TO TELETYPE COMMUNICATION



DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system. It is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

**Simple to install**

The DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

**Typical application**

The DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

**Special Dial-Text 50 features & benefits**

The DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

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**BOX**

The DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

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The DIAL-TEXT 50 is a complete teletype system (TTY) for use in the home or office. It is designed to be used with a computer or a terminal. It is a simple to install and use system.

£29.95  
£1.00 p.p.h.

£6.95  
£2.95 p.p.h.



Duplex Communications Ltd, 10 High Street, Stone, Staffs ST15 8JL, UK. Tel: 0771 84011.  
Middlesbrough - 2 Lark Lane, Salford, Lancashire LS11 3AP. Tel: 0542 3333.

## MICRO MAD?

### Crazy about Computers? Fancy training in USA?

Here's an opportunity to take your hobby to work!

Our client, part of a worldwide telecommunications Group, wish to recruit an enthusiastic young person, possibly a school or college leaver, for the post of APPLICATION SUPPORT ENGINEER for an exciting new service.

The likely candidate will have extensive MICRO programming experience, not necessarily gained through formal training, and be seeking a position with tremendous challenge, scope and responsibility.

- This unique job will interest someone with a basic knowledge of communications, who is in touch with market trends and wants the opportunity to become involved in-
  - providing technical support to customers
  - evaluating new micros, modems and terminals
  - assisting in the selection and distribution of micro software
  - compiling a comprehensive library of instructions for operating and interfacing micros and terminals.

If you are keen to spend all day experimenting with micros, totally immersed in hardware and software, then this is the job for you!

Interested?

Please contact: Andrew Millhouse, quoting ref. 272,  
at Deansgate Management Services, 52 Bedford Row,  
London WC1R 4LX. Tel: (01) 405 1260.

# It's lonely at the top TULIP SYSTEM<sup>®</sup> I of CompuData.

WANTED: THE U.K.'S TOP 50 DEALERS



CompuData markets one of the most powerful and fastest micro computers in the world.

This is due to the application of an 8086 microprocessor and an 8087 arithmetic co-processor. The fourth generation is now a fact; not only is speed important, but also the ergonomic requirements satisfied. The ease with which the TULIP SYSTEM<sup>®</sup> I can be operated is unparalleled, partly due to the vast keyboard with its 104 keys. What is more, TULIP SYSTEM<sup>®</sup> I can be used with many types of available software.

Internal memory capacity is 128 k minimum extensible to 896 k. Floppy disk units are 800 kb formatted. A 350 Kb unit is also available for low cost applications. For high speed and high capacity requirements, hard disk units, using Winchester technology, are available in capacities of 5 and 10 Mb.

The 8 standard character sets ensure maximum flexibility. The colors and the high resolution graphics make the TULIP SYSTEM<sup>®</sup> I unique. Contact your dealer, he can tell you all about it, or write CompuData.



**Computer** • Processor: 8086, 8087 (opt) • Clock: 8 Mhz • RAM: 128-896 Kb • Serial I/O: RS-232 • Parallel I/O: Centronics comp. • Interfaces: Hard-disk, tape, lightpen • FI disk controller: 8 inch + 5 1/4 inch • Buffered Keyboard: 104 keys  
**Storage** • Floppy disk: Dual 5 1/4 inch; 1.5 Mb • Hard disk - fixed: 5 Mb, 10 Mb **Display** • Formats: 80 x 25, 64 x 31, 40 x 25 • Low res. graphics 100 x 100 • High res. graphics: 786 x 288 (opt) • Colour: 8 • Internat. char. sets: 8 softw. selectable.

Send me details of dealership TULIP SYSTEM<sup>®</sup> I by return.

company \_\_\_\_\_  
name \_\_\_\_\_  
position \_\_\_\_\_  
town \_\_\_\_\_  
postcode \_\_\_\_\_  
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's-Hertogenbosch The Netherlands Tlx:  
50316 cdata NL Tel: +31 73 422045















Make & Model	Price inc VAT	Printhead type (M = matrix)	INTERFACES					Max load rate	Buffer Memory Size (in characters)	Lines per inch	Characters per inch	Max print Speed (SPS)	Max print positions	Max paper width in inches	Size (table area in cms)	Weight (in lbs)	Max Copies	Underlining	Bold Type	True Escapements	Proportional Spacing	Block Graphics	High Resolution Graphics	Bi-Directional	Logic Seeking	Feed Method				Distributor			
			I-EEE	Centronics	Z80a	RS232	Others (+)																			Fan Fold	Roll	Cut Sheet	Tractor		Freeroll		
Systeme Sysprint-S	£1,599	M				●			9600	256	6.8	10	120	132	16	71.7×61	53	6															S4
Tandy TRS 80 DW2	£1,299	Daisywheel		●					9600	2000	6	10,12	43	163	16.5	62.4×20.4	27	4														T1	
Texas Instruments 745	£1,470	Thermal		●					300	256	6	10,17	30	80	8.5	39.1×40.6	13.5	1														R1	
Texas Instruments 781	£1,259	Thermal 7×5							9600	256	6	10,17	120	80	8.5	40.6×15.24	8.5	1														D5	
Texas Instruments 810	£1,369	M 9×7		+	+	●			9600	256	6.8	5.8,10,16.5	150	132	15.5	65.4×50.8	25	9														D5	
TRD 170S	£834	Daisywheel		○					19200	256	6	10,12,15	17	132	15.5	64×45.7	40	5														D5	
Toshiba T1350	£1,495	M		○		○			9600	256	6	10,12	192	192	15	55×38	19.9	3														T4	
Walters WM2000	£477	M 9×9		+	○	+			19200	750	6.8,12	5.6,6.8,3,10,13,3,16.6	128	132	10	43.9×33.5	12	4														W1	
Walters WM4000	£713	M 9×9		+	○	+			19200	1500	6.8,12	5.6,6.8,3,10,13,3,16.6	150	220	15	63×39	13	5														W1	
Walters WM80	£230	M		●			●		9600	2000	7	8	80	142	9½	340×300	4	2														W1	
ZX Printer	£40	Electrical						1	N/A	N/A	9		32		4	14×4.6	N/A	1														S5	

## MONITORS

These have been split into **colour** and **monochrome**.

**Screen size** is a diagonal measurement in inches. Nearly all monochrome monitors accept a composite video signal from the operator and most computers are equipped with composite video output. Colour monitors feature a wider range of signal systems than mono and it is important to match the output of your computer to the colour of the monitor.

An **audio channel** will enable sound to be output from a speaker inside the monitor. **Mono tint** refers to the colour of the text on a mono monitor. Some monitors come with an **anti-glare filter** to relieve operator discomfort.

**Band width** refers to the frequency range of signals to which the monitor can respond in MegaHertz. **Dot resolution** indicates the number of dots which can be displayed across the screen; the more dots, the sharper the picture.

**Dimensions** indicates the area the unit occupies on the desktop.

Make & Model	Price inc VAT	Screen size (in inches)	Signal				Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (lbs)	Distributor
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear					
Commodore 1701	£230	14	●	●			8	320	14.2×16	14.6	C2
Crofton C1401	£300	14	●				10	600	37×42	10	C4
HM 2713	£3,120	13	●				25	720	54×40	36	B1
HM 2719B	£2,553	19	●				25	960	50×49	46	B1
HM 2719C	£3,042	19	●				25	960	50×49	46	B1
HM 3619	£3,548	19	●				45	1280	50×44	48	B1
Kaga Vision II	£327.75	12				●	15	510	32×30.3	12.5	D6
Lion Cub 1431-TTL	£286	14	●				7	585	65×57.5	11.5	S6
Lion Cub 1436	£316	14		●			7	585	65×57.5	11.5	S6
Lion Cub 1445	£633	14		●			15	895	65×57.5	11.5	S6
Lion Cub 1451-TTL	£430	14		●			10	653	65×57.5	11.5	S6
Lion Cub 1455	£483	14		●			10	653	65×57.5	11.5	S6
Lion Cub 1459	£459	14		●			10	653	65×57.5	11.5	S6
Lion Cub 2031-TTL	£344	20		●			7	585	65×57.5	11.5	S6
Lion Cub 2051-TTL	£646	20		●			10	940	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size (in inches)	Signal				Band width (in MHz)	Dot resolution	Dimensions (cms)	Weight (lbs)	Distributor
			Modulated PAL	Unmodulated PAL	TTL RGB	75 Ohm linear					
Luxor Digital	£574	14					25	800	N/A	15.7	P1
Luxor Linear II	£643	14					25	800	N/A	15.7	P1
Microtech 14	£402	14	●	●	●	●	18	585	33.7×40.8	12.6	M6
TM 22	£329	6					5.5	N/A	22×34.5	4.1	J3
VM 14 PSN	£378	14					5.5	300	47×40	13.6	J3
Wolf Cub 1435-TTL	£358	14					7	653	65×57.5	11.5	S6
Wolf Cub 1456	£454	14					10	653	65×57.5	11.5	S6

Make & Model	Price inc VAT	Screen size	Composite video		Mono tint	Anti-glare filter	Band width (MHz)	Dot resolution	Dimensions (cms)	Weight (lbs)	Distributor
			Audio channel	Audio channel							
AVT DM210G	£138	12	●	●	Green	●	12	750	30.8×29.6	9.5	L1
EG 100	£77	12	●	●	Green	●	8	700	37.5×29	8	L1
EG 101	£91	12	●	●	Green	●	12	700	37.5×29	8	L1
LEDM 091D	£99	9	●	●	B&W	●	12	750	22×24	5.4	L1
LEDM 0910	£121	9	●	●	Green	●	12	750	22×24	5.4	L1
Luxor 10	£212	10	●	●	Orange	●	22	625	N/A	8	P1
Luxor 15	£283	15	●	●	Orange	●	22	625	N/A	13	P1
M9	£131	9	●	●	Green	●	15-22	650	22.4×25.7	5.7	P1
M12	£144	12	●	●	Green	●	15-22	800	29.3×30	9.3	P1
Novex	£114	12	●	●	Green	●	12	750	N/A	N/A	P1
N12 1003	£112	12	●	●	Green	●	24	800	23×26.5	7	P1
Prince	£126	12	●	●	Green	●	24	800	33×50	7	C4
PM 102	£126	9	●	●	Green	●	24	800	22×28	7	C4
U300	£149	12	●	●	Green	●	18	N/A	34.8×36.8×29.2	7.7	R4







Make and Model	Price inc VAT	Capacity	No. of disks	Tracks	Sectoring	Sales and security	Connects to										Distributor	
							IEEE	RS232	BBIC	Apple II	St. Shugart	Nasibus	Gemini	Z80	Others			
F 320	£2,300	2.4Mb	2	76	Soft	DS	DD											B5
M 2894	£499	1.6Mb	1	77	Soft	DS	DD											A3
M 2896	£493	1.6Mb	1	77	Soft	DS	DD											A3
Megastor 11 DD	£1,133	2Mb	2	77	Soft	DS	DD											V1
Megastor 11SD	£1,018	1Mb	2	77	Soft	DS	SD											V1
Megastor 111	£1,121	2Mb	2	77	Soft	DS	DD											V1
R.M. FDS-2	£3,789	1Mb	2	77	Soft	DS	SD											R3
Tandy Model 11	£999	486K	1	77	Soft	DS	SD											T1
Tandy Model 16	£949	1.2Mb	1	77	Soft	DS	DD											T1
Tandy Model 16	£1,549	2.5Mb	2	77	Soft	DS	DD											T1

## MODEMS

A modem interfaces a computer and the telephone system so computers can communicate over long distances. It converts data to electrical pulses or sounds that can be sent down the line. A modem can be connected to the line directly or acoustically. A D in the connection column represents direct link, while A indicates acoustic. The acoustic coupler is like a female telephone handset with a speaker in the coupler opposing the phone's mouthpiece and a microphone opposing the earpiece. A B in this column indicates that both methods of attachment are available. **Baud** rate shows the speed with which the data is transmitted.

The modem must be connected to the computer through an interface. The interface column lists the main interfaces featured on each modem. **Asynchronous** means that data may be transferred at intervals as available or as needed. **Synchronous** data is transmitted at regular intervals. **Simplex** transfers data in one direction, while **half duplex** can transmit/receive in either direction, but not simultaneously. **Full duplex** transmits and receives information in both directions at once. Some modems can originate a call or start a two-way conversation. **Answers** means they can respond to a call from another computer.

Make and Model	Price inc VAT	Connection	Data Rate (baud)	Interface	Others	Capabilities						Distributor	
						Asynchronous	Synchronous	Simplex	Half Duplex	Full Duplex	Originate		Answer
AD 1223	£287.50	D	1200	RS232									A6
AJ 311	£320	B	300	RS232									A5
AJ 1234	£684	A	1200	RS232									A5
AM 211	£387	B	300	RS232									A5
Bermac 1200/1 Model A	£414	D	1800	RS232									B3
Bermac 1200/1 Model B	£460	D	1800	RS232									B3
Commodore 64 Modem	£99.95	D	1200	C-64 cartridge port									C2

## DISTRIBUTORS

A1 Appropriate Technology, 01-625 5575 **A2** Advent Data Products, Melksham 706289 **A3** Alex Microcomputers Ltd, Reading 791579 **A4** Atari International (UK), Slough 33344 **A5** Anderson, Jacobson Ltd, Slough 25172 **A6** Alpha Datasystems, 058 27 86136 **B1** Bytech, Reading 61031 **B2** British Olivetti, 01-785 6666 **B3** Barron McCann, Biggleswade 316286 **B4** Bencom Sendata (UK), 01-940 1386 **B5** Baydel Ltd, Leatherhead 378811 **B6** BASF, 01-388 4200  
**C1** Centronics, 01-581 1011 **C2** Commodore Business Machines, Slough 79292 **C3** Caipom Ltd, Bracknell 50211 **C4** Crofton Electronics, 01-8911923 **C5** Canon (UK) Ltd, 01-680 7700 **C6** Cumana, Guildford 503121 **C7** CBL, Reading 792097 **C8** CWP, 01-628 9000  
**D1** Discom, Evesham 3591 **D2** Datatrade Ltd, Northampton 22289 **D3** DNCs Ltd, 061-643 0016 **D4** DRG, Weston-super-Mare 415398 **D5** Data Systems Division, Bedford 233889 **D6** Data Efficiency, Hemel Hempstead 63561 **D7** Data Track Technology, New Milton 519650 **D8** Dacom Systems, Milton Keynes 676757  
**E1** Epson (UK), 01-900 0466 **E2** Elecomatic, 041-981 5825 **E3** Eicon, Barhill 81825 **E4** Environmental Equipments Northern Ltd, Nantwich 625115  
**F1** FAST, Reading 791557  
**G1** Geveke Electronics, Woking 26331 **G3** G. G. McMichael, 02816 502 **G2** Gemini Micros, Amersham 26321  
**H1** HAL Computers Ltd, Farnborough 517175 **H2** Haywood Electronic Assoc. Ltd, 01-428 0111  
**I1** Informex Ltd, 01-316 4213 **I2** Infac Data Systems, Rotherham 547170 **I3** ITT Business Systems, Brighton 507111 **I4** ITT Consumer Products, Basildon 3040 **I5** Intelligent Interfaces, Stratford-upon-Avon 296879 **I6** Intergrex, 0283 215432

CCITT CAT	E228	A	300	RS232/V24															
CDSV22	£719	D	1200	RS232/V24															D8
DSL2123	£329	D	300/1200	RS232/V24															D8
Prism VTX 5000	£99.95	D	1200	Sinclair Spectrum															P3
Prism 1000	£69.95	D	1200	RS232															P3
Prism 2000	£84.94	D	1200	RS232															P3
Sendata 700 Series A	£253	A	300	RS232, 20ma	1														B4
Sendata 700 Series B	£224	A	300	RS232, 20ma	1														B4
Sendata 700 Series C	£309	A	600-1200	RS232, 20ma	1														B4
Sendata 700 Series E	£149	A	300-1200	RS232, 20ma	1														B4
Racal 126 LS1	£782	D	2400	V24															R2
Racal MPS 3021	£295	D	300	V24															R2
Racal MPS 1222	£678	D	1200	V24															R2

## PLOTTERS

Plotters use a pen to put graphics or characters on paper under the command of a computer. They are usually one of two types — flatbed or drum. A flatbed holds the paper flat while the pen draws on it in two dimensions. A drum plotter turns the paper vertically on a cylinder while the pen moves horizontally. Most plotters can change pens during operation so a variety of colours and line thicknesses are available. **Max pens** indicates the number of pens in operation or on standby. Dimensions of the paper to be used are listed under **paper size**. **Maximum plotting speed** measures the distance in millimetres per sec covered by the pen. **Interfaces** are included in the basic price or come at extra cost.

Make and Model	Price inc VAT	Type	Max Pens	Paper Size	Maximum Plotting Speed in in/sec.	Interface (+£40 extra con)	Distributor
Calcomp 81	£3,392	Flat	8	A3	30cm	RS232 or IEEE	C3
Commodore 1520	£170	Drum	4	4 1/2"	52mm	Commodore Serial	C2
HP 7470A	£1,317	Drum	2	A4	38.1cm	RS232 (IEEE+)	H2
MT Pkxy 3	£688.85	Flat	3	A4	200mm	Parallel (RS232 +)	M3
PD4	£585	Flat	1	A4	700mm	(IEEE+)	J2
RY-10MZ	£747.50	Flat	1	A4	200mm	Centronics, (RS232+)	R5
Stroke 100	£1,865	Flat	8	A3	400mm	Centronics, (RS232, IEEE+)	R5
Stroke 100	£662	Drum	1	A4	7.6cm	(RS232, Parallel+)	D6
TRS-80 Pen Plotter	£1,399	Flat	6	A4	6.8cm	RS232	T1
Watanabe WX 4635	£2,301	Flat	1	A3	250mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4637	£2,862	Flat	2	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe 4638	£2,635	Flat	1	A3	400mm	(Centronics, RS232, IEEE+)	E4
Watanabe WX 4671	£1,129	Flat	1	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4675	£1,638	Flat	6	A3	50mm	Parallel (RS232, IEEE+)	E4
Watanabe 4731	£1,761	Drum	4	A3	200mm	(Centronics, RS232, IEEE+)	E4

**J1** Jones & Brother, 061-330 6531 **J2** J J Lloyd Instruments, Lookshate 4221 **J3** JVC, 01-450 2621  
**L1** Low Electronics, Matlock 4995  
**M1** Mitsui & Co Ltd, 01-600 1777 **M2** Modata, Tunbridge Wells 41555 **M3** Mannesmann Tally Ltd, Reading 788711 **M4** Micropute, Macclesfield 615384 **M5** Microware, 01-272 6237 **M6** Microtech Leeds, Leeds 679964 **M7** Mico Peripherals Ltd, Basingstoke 3322  
**N1** Newbury Data Recording, Newbury 48864  
**P1** Phoenix Technology, 01-737 3333 **P2** Petre & Pam Computers, Rossendale 227011 **P3** Prism Microproducts 01-253 2277  
**Q1** Quime (UK) Ltd, Reading 584646  
**R1** Rail Ltd, 01-836 6921 **R2** Riva Terminals, Woking 71001 **R3** Research Machines Ltd, Oxford 249866 **R4** Roland (UK) Ltd, 01-568 4578 **R5** Rikadenko Mitsui Electronics, 01-397 5111 **R6** Real Time Printers Ltd, 0276 681444  
**S1** Sinton Electronics, Reading 875464 **S2** Sord, 01-930 4214 **S3** Stottron, Coventry 613521 **S4** Systime, Leeds 702211  
**S5** Sinclair Research, Camberley 685311 **S6** Silicon Express, Leicester 374917 **S7** Sharp Electronics, 061-205 2333  
**T1** Tandy Company, Walsall 648181 **T2** Triump Adler, 01-250 17173 **T3** Trend Computers, 06285-24977 **T4** Toshiba Office International, Sunbury-on-Thames 85666 **T5** Torch Computers, 06284 75303  
**V1** Viasac, High Wycombe 448633  
**W1** Waters Microsystems Int Ltd, 0494 32751  
**X1** X-Data Ltd, Slough 723331  
**Z1** Zygol Dynamics, Bicester 3361 **Z2** Zenith Data Systems, 0452 29451

**Issue 1, March 11-18.**

**Pro-Tests:** Apple's Lisa, Text T8000; Spectrum speech synthesizer, Apple printer, Commodore network, 3D on Spectrum, graphics package for Apple and IBM, BBC graphics system.  
**Features:** computer chess, Occam parallel processing language, Virco/Sirus function keys.  
**Programs/Cards:** Towers of Braham (Pascal), Birthym (Apple II), Roman Year (Apple II), Shape Utility (Apple II).  
**Gameplay:** Darts, Soccer (Atari), Castle of Riddles (BBC Model B), Pamina (Spectrum), Flight Simulator (IBM PC).  
**Databases:** micros and peripherals.

**Issue 2, March 18-25.**

**Pro-Tests:** Toshiba T100, Casio PB100, ZX81/Basicare, Vic speech synthesizer, Spectrum spreadsheet, IBM graphics, BBC word processing.

**Features:** Colecovision micro bagpackman, nursery computing, Gameplay: Ultima II (Apple), Under (ZX81), Star Trek (Vic 20), Hungry Horace (Spectrum).  
**Programs/Cards:** String editor (Spectrum), Analogue (BBC Model B), Chart generator (Spectrum), String extract/replace.  
**Databases:** full software listings.

**Issue 3, March 25-April 1.**

**Pro-Tests:** TI Professional, Apple speech synthesizer, Facit 410 printer, IBM keyboards, Pisped compiler, Sirus toolkit, Dragonmail.

**Features:** Atom upgrade, Lynx programming, Apple music, Gameplay: Matigrove (Vic 20), Mutator (Herd (Vic 20), Compendium (Dragon), Patience (Spectrum), Noughts and Crosses (Dragon), Spider (Vic 20), Firing Range (BBC).  
**Databases:** micros.  
**Micromedia:** Anatomy of the BBC, part 3.

**Issue 4, April 1-8.**

**Pro-Tests:** Pled Printer Communicator, Olympia ES5000 printer, Namal Superkiller, Commodore Calcresul, Spectrum Pascal, Cashbook (BBC).  
**Gameplay:** Dark Crystal (Apple II), St. George (Dragon), Wizard War (Dragon).  
**Programs/Cards:** Fruit Machine (Error), Tunesmith (Oric), Arroy (Error).  
**Databases:** peripherals.  
**Clubset:** Clubs and user groups.  
**Micromedia:** Go Forth, part 1.

**Issue 5, April 8-15.**

**Pro-Tests:** Commodore 700, Ikon Hobbit, 1-2-3 (IBM), ZX81 machine code.  
**Features:** speech packs, monitors, Gameplay: Grand Prix (Dragon), Derby Day (Spectrum), Deadline (Apple).  
**Programs/Cards:** Wacky Racers (Oric), Fruit Machine (Oric), Parse Intergr.  
**Databases:** Software.  
**Clubset:** full list of user groups.  
**Micromedia:** Go Forth, part 2.

**Issue 6, April 15-22.**

**Pro-Tests:** Tycosm Microframe, IBM PC, Scorpio Disks, Dragon sound module, ZX81 graphics, Bottom Line Strategist (CPM), PaperClip word processor.  
**Features:** IBM PC DOS, BBC word processing, PC-1251  
**Gameplay:** Mineclout (Spectrum), Transylvanian Tower (Spectrum), Lunar Keeper (Apple II), Evolution (Apple II).  
**Programs/Cards:** Wacky Racers (Oric), Mortgage Comparison

# COMPUTER

(Sharp M280K), Computer Set Up (Dragon), Musical Aquarius, Database: micros, part 1.  
**Micromedia:** Graphics, part 1.

**Issue 7, April 22-29.**

**Pro-Tests:** Musical Aquarius, Epson FX80, Olivetti J101, Lisp on Spectrum, Vic 20 assembler, Supergraphics, Colour Gen and Genie 1.

**Features:** Dealer support, Atari graphics, Gameplay: Krakit (ZX81), Cruising On Broadway (Spectrum), Kaktus (Vic 20), Fantastic Voyage (ZX81).  
**Programs/Cards:** CBM controls, Computer Set Up (BBC), Wacky Racers (Oric), Julian Dates.  
**Databases:** Peripherals.  
**Micromedia:** Graphics part 2.

**Issue 8, April 29-May 6.**

**Pro-Tests:** Atari Home Files Manager, Kohra Vix Stat for the Vic 20, Hestecars's Accounts for the Spectrum, Epson RX30 printer, NCR's Decision Mate V, Future Computer's FX20.

**Features:** Micronet, Compact programming on the T199-44, Gameplay: Harvester (Vic 20), Strategic Command (Dragon) 32, first Book of Micro Rhymer (BBC), Telling the Time/Money (Spectrum).  
**Programs/Cards:** Program Indexer (BBC/B), CBM Database cards 1-4, Sort/Extract.  
**Databases:** software.

**Issue 9, May 6-13.**

**Pro-Tests:** Structured Basic on the Apple, Pixel Power on the Vic 20, Star DP510 printer, Dams and Interplay's Interfaces for Commodore 64, Micro-Professor.

**Features:** IBM Functionkeys, Atari word processing, Gameplay: Dungeons of Intrigue (Oric), The Grassing (Apple), Starship Command (BBC/B), Dragon Trek, Nowotwa (Puzzle) (Spectrum).  
**Programs/Cards:** Program Indexer (BBC), CBM database cards 5-6, Monster (Spectrum), Wildcard Search (MIBASIC).  
**Databases:** hardware.  
**Micromedia:** Graphics, part 4.

**Issue 10, May 13-20.**

**Pro-Tests:** Infomart on Commodore 64, Dragon Maze, MC20 and CMU800 music synthesizers (Apple), Train directly compiled mod, Epson GX10.

**Features:** ZX81 graphics part 1; Atari word processing part 2.  
**Gameplay:** Rescue (Spectrum), Dictator (Spectrum), Roman Empire (Spectrum), Chyplifier (Vic 20), Sokoban (Vic 20).  
**Programs/Cards:** Atom Jack (Lynx), Escape (Spectrum), Database cards 7-9, Evaluate (MIBASIC), Formula (BBC/B).  
**Micromedia:** Graphics, part 5.

**Issue 11, May 20-26.**

**Pro-Tests:** BBC Vaffle, PFS-File for IBM, Apple Pascal, printer communication, Pektaj Jovystic Controller for ZX81 and Spectrum; CSE Compuserver Board.

**Features:** ZX81 graphics part 2, Base on the Sharp M280K, Gameplay: Motor Mania (Commodore 64), Oric Fight, BBC Music Synthesizer, Music Maker (Spectrum), Emboss, Assault (Spectrum), Tobor (Spectrum).  
**Programs/Cards:** Homeward Bound (Spectrum), Emboss (Spectrum), Ring of Darkness (Dragon 32), CBM Database, cards 10-11.  
**Micromedia:** Keyboards.

**Issue 12, May 27-June 2.**

**Pro-Tests:** Spectrum word processor, PFS for Report on IBM, File Handling for Colour Gen, C31 (CP80) type 1 printer, TG Trackball, Nord MS.

**Features:** Sibus Basic, Oric sound part 1, Tandy Colour graphics, Gameplay: Mad Marlin (Spectrum), Fresh (Spectrum), Headhanger (Spectrum), Oric roundup.  
**Programs/Cards:** Election Barchart (Commodore 64), Memo, Tilly (BBC/B), Munch (Spectrum).  
**Databases:** Hardware.  
**Clubset:** clubs (Cambridge Micro-computer Club special).  
**Micromedia:** Disk Drives, part 1.

**Issue 13, June 3-9.**

**Pro-Tests:** Teletwriter for Dragon 32, Absorbent Forth for Spectrum, GP3 graphics processing system for Apple II, joystick, rulers, Alike.

**Features:** Dragon met Tandy, Oric music part 2, transferring Epson FX80, Colour Gen and Genie 1.

**Gameplay:** Everest Ascent (Spectrum), Colour Gen (Spectrum), Micro Maze (Jupiter Ace), Oric Base, Jovystic Control Unit (Vic 20).  
**Programs/Cards:** Cupid (Oric), Alien (Dragon 32), Time Bomb (Star).  
**Databases:** peripherals.

**Issue 14, June 10-June 15.**

**Pro-Tests:** Apple Accelerator II board, Modula-2 (Apple II), Oric Base, Jovystic Control Unit, Kempston Centronics Interface, BBC Speech Synthesizer.

**Features:** Newbrain Basic part 1, Sibus designing.  
**Gameplay:** All Diddums (Spectrum), Monopoli (Commodore 64), Automopoli (Spectrum), Dragon dramas.  
**Programs/Cards:** Time Bomb (Atari.com), Sheep Drive (BBC).  
**Databases:** Software.  
**Micromedia:** Spectrum, Part 1.

**Issue 15, June 16-June 22.**

**Pro-Test:** Conn 35, Address Manager (Spectrum), Lynx (Commodore 64), MST Database (Epson HX-20), Voice Input Module (Apple II).

**Features:** Newbrain Basic part 2, Gene scene.  
**Gameplay:** Cleared for Landing, Playing the Ace (Apple II), Val-tourist, Star Hammer (Dragon 32), Program/Cards: Mover (BBC/B), Sprite Clock (Commodore 64), The Island (Atari), 3 of 9s, Micro-mind (Colour Gen), Brickbat (Dragon 32).  
**Databases:** Hardware.  
**Micromedia:** Spectrum, part 2.

**Issue 16, June 23-June 29.**

**Pro-Tests:** Atari v Acorn, word processing, Atari word processing, simplifide (CPM), MPF-II printer, Z80 Pack for BBC.

**Databases:** Hardware, US mail order, Atari graphics.  
**Gameplay:** Computer Scrabble (Spectrum), Education (BBC), Horace and Spiders (Spectrum), Catcha Snatcha (Vic 20).  
**Databases:** Hardware.  
**Micromedia:** Video Tiler (T199-4A 3 of 6), Bowling (Spectrum), Private Island (Atari.com).  
**Micromedia:** Spectrum, part 3.

**Issue 17, June 30-July 6.**

**Pro-Tests:** Duet-16, The Organizer (CPM), Trake and ZXText (Spectrum), Juki 1100 daisywheel, Video Ultra Term (Apple II).

**Features:** Leaving part 1, Atari screen action.  
**Gameplay:** Oric chess, Grand Master (Commodore 64), Escape from Orican (BBC), Jet Pac (Spectrum), The Ring of Darkness (Dragon 32).  
**Programs/Cards:** Ultra Term (Apple II), Video Tiler (Oric), Video Tiler (Atari.com) Word processor (BBC).  
**Micromedia:** Sound, part 1.

**Issue 18, July 7-13.**

**Pro-Tests:** Tandy 100, RS232C interface (ZX81), ROM pack (Commodore), Interface printer buffer, IBM Personal Basic, Spectrum assembler, Newbrain WP.

**Features:** Leaving Part 2, Lynx sound.  
**Gameplay:** Spectrum Bagkamon, BBC Snooker, Commodore 64 roundup, Serpentine (Vic 20), Post (Spectrum), Spectrum Safari (Spectrum), Program/Cards: Word Processor (BBC), Fruit Machine (Spectrum).  
**Micromedia:** Sound Part 2.

**Issue 19, July 14-July 20.**

**Pro-Tests:** 16-bit chess, Stock control, Supergraphics (Dragon), Malpas (Torch), Smith-Corona daisywheel, ZX81 word processing.

**Features:** Insurance, buying second-hand.  
**Gameplay:** Escape MCF (C64), Escape from Perilous (Atari), Apple roundup-TEMP of Aphai (C64), Airline (Spectrum), Heathrow (Spectrum).  
**Programs/Cards:** Colour Code (Atari), Wreck (Dragon).  
**Micromedia:** Sound, part 3.

**Issue 20, July 21-July 27.**

**Pro-Tests:** Rade barbaud, Vic digital tape drive, Seikoha colour printer, Toolkit (Spectrum), Bonus (Per payroll), Newbrain monitor.

**Features:** Computer art, Dragon scrolling.  
**Gameplay:** Rabbit Trail (T199-44), Artex Challenge (Atari, Vic 20, T199-44), Bole Round-up, Joust (Spectrum), MMR Mail (Spectrum), Print Shop (Spectrum), Time-Lords (BBC).  
**Programs/Cards:** Tumbler (Oric), Wreck (Dragon), Atari Error, Speed Race (Vic 20).  
**Micromedia:** Sound, part 4.

**Issue 21, July 28-August 3.**

**Pro-Tests:** BBC graphics, Newbrain assembler, BBC turtle, Oric printer, Triumph printer.

**Gameplay:** Franklin's Tomb (Dragon), Hummer House of Horror (Spectrum), Jumpman (64), Jumping Jack (Spectrum), Fourth Element (Vic) Cyclon (64).  
**Programs/Cards:** Collection (Vic), Bomber (64), Defender (BBC).  
**Micromedia:** Sound, part 5.

**Issue 22, August 4-August 10.**

**Pro-Tests:** Spectrum Forth, BBC graphics, Music synthesizers, IBM plotter, Brother daisywheel, Malpas keyboard, Magid.

**Features:** Generic assembler, Dragon machine code.  
**Gameplay:** River Rescue, Oric Attack (Atari), Zork (64), Knot in 3D, 3D Combat Zone (Spectrum), Morts (Oric), XPM's Lair (Spectrum).  
**Micromedia:** CPM's Part 1.

**Issue 23, August 11-August 17.**

**Pro-Tests:** NEC's Advanced Personal Computer, Financial Planner (IBM), Kong's a.b.c. (Spectrum), Hot Dog Spoons (Spectrum), Prom ATX40, Extended Basic (Dragon).

**Features:** Spectrum machine code, Gameplay: Grader, Glowpelt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Spectrum General Election (Spectrum).  
**Micromedia:** Dragon, part 3.

**Issue 24, September 2-September 8.**

**Pro-Tests:** Microtan 65, BCP1, BBC tracer, 80 columns Per, Oric interfaces.  
**Gameplay:** Magic Mountain, Smugglers Cove (Spectrum), Spectrum roundup, Matrix (64), Ninja Warrior (Dragon), Dallas (Oric), Dragon roundup, Jigger (Oric), Frogger (IBM).  
**Micromedia:** Commodore 64.

**Issue 25, September 8-September 14.**

**Pro-Tests:** Sharp M230, BBC Lsp, Apple editor, IBM music, ZX81 surgery.  
**Gameplay:** Zap-Zap, Zzom (Spectrum), Spectrum roundup, Hoover Bover, Benji-Save Rescue (64).  
**Micromedia:** Dragon, part 1.

**Issue 26, September 15-September 21.**

**Pro-Tests:** Zenith 1100, Snail Logo, Atari Supergraphics, Newbrain P.M. IBM music code.  
**Gameplay:** The Witness, Super Scramble, Six (64), Harrier Attack (BBC), Microsculpt (Dragon 32), Pharaoh's Tomb (Spectrum).  
**Micromedia:** Dragon, part 2.

**Issue 27, September 22-September 28.**

**Pro-Tests:** Portico/Miracle, Dragon text, BBC toolkit, Dragon keyboard, Magid.  
**Features:** HX20 disassembles, 11 transformations.  
**Gameplay:** Grader, Glowpelt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Spectrum General Election (Spectrum).  
**Micromedia:** Dragon, part 3.

**Issue 28, September 29-October 5.**

**Pro-Tests:** NEC's Advanced Personal Computer, Financial Planner (IBM), Kong's a.b.c. (Spectrum), Hot Dog Spoons (Spectrum), Prom ATX40, Extended Basic (Dragon).

**Features:** Spectrum machine code, Gameplay: Grader, Glowpelt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Spectrum General Election (Spectrum).  
**Micromedia:** Dragon, part 3.

**Issue 29, October 6-October 12.**

**Pro-Tests:** Atari 600XL, Condor

**Issue 23, August 11-August 17.**  
**Pro-Tests:** Sord Basic G, Tawford, BBC microflippers, Microdrive, Tandy Model 4.  
**Gameplay:** Bridge Master, Stri, Manic Miner (Spectrum), Atari roundup, Candy Floss/Hangman (BBC), Everest (Dragon).  
**Micromedia:** CPM, part 2.

**Issue 24, August 18-August 24.**  
**Pro-Tests:** T-Maker III, Spectrum Fifth, daisywheels surveyed, Dragon digital zipper, Laser (Vic 20).  
**Gameplay:** Vidotex, Spectrum machine code.  
**Features:** Oric roundup, Cooking, Egg Farm, Xadom (Spectrum), Sea Lord (BBC), Lusitanic (Dragon), The Island (Oric).  
**Micromedia:** Commodore 64, part 1.

**Issue 25, August 25-August 31.**  
**Pro-Tests:** Electron, Simons Basic, Oric monitors, Microdrive.  
**Features:** Newbrain map, Acorn Atom, Dragon machine code.  
**Gameplay:** Suspended (64), Terror Dakits, Tranz Am (Spectrum), Dragon roundup, Jigger (Oric), Frogger (IBM).  
**Micromedia:** Commodore 64.

**Issue 26, September 1-September 7.**  
**Pro-Tests:** Microtan 65, BCP1, BBC tracer, 80 columns Per, Oric interfaces.  
**Gameplay:** Magic Mountain, Smugglers Cove (Spectrum), Spectrum roundup, Matrix (64), Ninja Warrior (Dragon), Dallas (Oric), Dragon roundup, Jigger (Oric), Frogger (IBM).  
**Micromedia:** Commodore 64.

**Issue 27, September 8-September 14.**  
**Pro-Tests:** Sharp M230, BBC Lsp, Apple editor, IBM music, ZX81 surgery.  
**Gameplay:** Zap-Zap, Zzom (Spectrum), Spectrum roundup, Hoover Bover, Benji-Save Rescue (64).  
**Micromedia:** Dragon, part 1.

**Issue 28, September 15-September 21.**  
**Pro-Tests:** Zenith 1100, Snail Logo, Atari Supergraphics, Newbrain P.M. IBM music code.  
**Gameplay:** The Witness, Super Scramble, Six (64), Harrier Attack (BBC), Microsculpt (Dragon 32), Pharaoh's Tomb (Spectrum).  
**Micromedia:** Dragon, part 2.

**Issue 29, September 22-September 28.**  
**Pro-Tests:** Portico/Miracle, Dragon text, BBC toolkit, Dragon keyboard, Magid.  
**Features:** HX20 disassembles, 11 transformations.  
**Gameplay:** Grader, Glowpelt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Spectrum General Election (Spectrum).  
**Micromedia:** Dragon, part 3.

**Issue 30, September 29-October 5.**  
**Pro-Tests:** NEC's Advanced Personal Computer, Financial Planner (IBM), Kong's a.b.c. (Spectrum), Hot Dog Spoons (Spectrum), Prom ATX40, Extended Basic (Dragon).

**Features:** Spectrum machine code, Gameplay: Grader, Glowpelt, California Gold Rush (64), Oric roundup, Bomb Alley (BBC), Spectrum General Election (Spectrum).  
**Micromedia:** Dragon, part 3.

**Issue 31, October 6-October 12.**  
**Pro-Tests:** Atari 600XL, Condor



**Series 20 (IBM), Acacia Non-Blade** (BBI), **Return of the Atari** (BBI).  
**Features:** Oracle sound routines.  
**Gameplay:** Greedy Gals (Spectrum), Kong (Spectrum), Crazy Kong (64), Cuthbert Goes Walkabout/Movie Producer (Dragon).  
**Programs:** Composer (Oric), 555 (Spectrum), Anagrams (Dragon).  
**Databases:** Peripherals.  
**Microspedia:** Everything you want to know about programming, part 2.  
**Clubset:** User Groups.

**Issue 32, October 13-October 19, 1984.**  
**Pro-Tests:** Mattel Computer Adaptor (Intellivision), Sprite-Gen (BBC), Typing Strategy (Apple), Soccer 2 (Spectrum), Cerech EPM Program (Apple).  
**Features:** Teletext options. Inside the Cosmic Gameplay: Space Shuttle Frogger (Dragon 32), Atari round-up, Spectralow 2/Football Pool Program (Spectrum).  
**Databases:** Software.  
**Clubset:** Clubs.  
**Programs:** Bees Away (BBC), Composer (Oric).  
**Microspedia:** Everything you wanted to know about programming, part 3.



**Issue 33, October 20-October 26, 1984.**  
**Pro-Tests:** CWP's Cortex, Sinclair ZX Interface 2, Wat-  
**PERSONAL COMPUTER**  
**Series 20 (IBM), Acacia Non-Blade** (BBI), **Return of the Atari** (BBI).  
**Features:** Oracle sound routines.  
**Gameplay:** Greedy Gals (Spectrum), Kong (Spectrum), Crazy Kong (64), Cuthbert Goes Walkabout/Movie Producer (Dragon).  
**Programs:** Composer (Oric), 555 (Spectrum), Anagrams (Dragon).  
**Databases:** Peripherals.  
**Microspedia:** Everything you want to know about programming, part 2.  
**Clubset:** User Groups.

**Issue 34, October 27-November 2, 1984.**  
**Pro-Tests:** NEC's PC-3201A, Simply File (64), The Forest (Spectrum), Amcom DFS (BBC), Currah Microscope (Spectrum).  
**Features:** Oracle Machine Code.  
**Gameplay:** Foot Apocalypse/Arayan (Atari), Death Crutch (BBC), Football Manager/Pool (Spectrum).  
**Programs:** French Test (Apple), Babyfalk (ZX81), Count (Vic 20), Man-Arth (Vic 20), Road Hog (BBC).  
**Databases:** Hardware.  
**Microspedia:** Everything you wanted to know about programming, part 5.

**Issue 35, November 3-November 9, 1984.**  
**Pro-Tests:** Kaypro 10, Stock Control (Spectrum), Educational games (BBC), Brother EP22 electronic typewriter, ADS Centronics Interface (Spectrum, Jupiter Ace).

**Features:** Tandy Graphics, BBC Operating System.  
**Gameplay:** Yalballa (Spectrum), 64 round-up, Slinky (Atari), Hexper (64).  
**Programs:** Mini Math (Spectrum), Multi-Square (Oric).  
**Databases:** Peripherals.  
**Microspedia:** Everything you wanted to know about programming, part 6.

**Issue 36, November 10-November 16, 1984.**  
**Pro-Tests:** Tiger from IHH, ZX81-Forth, Exmon (Oric), Cycle Planner, Growth Tracker/Diet/Diet Master (Spectrum), U-Com 2 (Apple).  
**Features:** Newbrain sound, BBC FX commands.  
**Gameplay:** Creepers (Vic 20), Exterminator (64), Spectrum round-up, Death Mines of Sinus (Dragon 32).  
**Programs:** Falklands Raid (BBC), Mini Math (Spectrum), Pyramid (Spectrum).  
**Databases:** Software.  
**Microspedia:** Everything you wanted to know about programming, part 7.



**Issue 37, November 17-November 23, 1984.**  
**Pro-Tests:** Apriport, Paint (Atari), BBC Micro Toolbox, Spectravideo Compunote (Atari VCS 2600), Big Eyes.  
**Features:** Flight simulators, Spectrum screening.  
**Gameplay:** Empire/Treasure Tomb, Crystal Chalice, Temple of Zores (Dragon 32), Cobus Maze/Bewitched (Vic 20), Cosmic Convo/Planetfall (64), Bugaboo (Oregon Spectrum).  
**Programs:** City Defense (Oric), Falklands Raid (BBC), Pyramid (Spectrum), Monitor (64).  
**Databases:** Clubset.  
**Microspedia:** Everything you wanted to know about programming, part 8.



**Issue 38, November 24-November 30, 1984.**  
**Pro-Tests:** Coloco's Adam, Small Business Accounts (Spectrum), Manicure (BBC), Monitor round-up.  
**Features:** Apple programming, NewBrain editor part 1, Dragon action part 1.  
**Gameplay:** Dragon round-up, Zepplin-Bite Max (Atari), Skramble/Falcon Patrol (64), 737 Flight simulator (BBC).  
**Programs:** Shipment (Spectrum), Monitor (64).  
**Databases:** Hardware.  
**Microspedia:** Guide to Monitors.

**Issue 39, December 1-December 7, 1984.**  
**Pro-Tests:** Dragon 64, Tandy CPC 220, White Knight II (BBC), Cross Reference Utility (IBM).  
**Features:** NewBrain editor part 2, Dragon Action part 2.  
**Gameplay:** Oric round-up, Haunted Hedges/Corridors of Genom (Spec-



**Issue 40, December 8-December 14, 1984.**  
**Pro-Tests:** Times 2026, Thermal Printer FP-10, Cambridge Computing joystick (Spectrum), Beebwh/De Synth-Music Processor (BBC), Vizavitee/Vizapell (64), Education games (Spectrum).  
**Features:** NewBrain editor part 3, Dragon Action part 3.  
**Gameplay:** Pinball Wizard (Vic 20), The Quest of Mercurad (64), Wavy Navy/Savage Pond (Atari).  
**Programs:** Link Four (Spectrum), Tilt (Dragon).  
**Microspedia:** Buyer's Guide to Peripherals.

**Issue 41, December 15-December 21, 1984.**  
**Pro-Tests:** Apple II, Byte Drive 500, INMAC Power Cleaner, Commodore 1701 Colour Monitor, BC-Base (64), Database-MST-Calc (Dragon).  
**Features:** Computerised Psychotherapy (BBC), Spectrum Display.  
**Gameplay:** Micropoly/Pettigrew's Diary (Dragon), 64 round-up, Dimension Destroyers/Sheer Panic (Spectrum).  
**Programs:** Colour Monitor Invader (Spectrum), Grid Bike (Vic 20).  
**Microspedia:** Buyer's Guide to Software.

**Issue 42, December 22-January 4, 1985.**  
**Pro-Tests:** Spectrum add-ons (U-Microcomputers system), Oric-1 Filestar, Games Designer (Spectrum).  
**Features:** Micros of 1983, Computer Security, BBC word processing.  
**Gameplay:** Dragon Action part 4.  
**Gameplay:** International Football (64), Grunch/Checkered Flag (Spectrum), Way Out/Jet Boot Jack (Atari), Super-vaders/Outback (Vic 20), Danger Ranger/Up Periscope (Dragon 32).  
**Databases:** Clubset.  
**Microspedia:** Games Special.

**Issue 43, January 7, 1985.**  
**Pro-Tests:** IBM Junior, Gradpad (BBC), Walters WM80 printer/Devisp (Spectrum).  
**Features:** Computerpack, Spectrum Display, Tabs on Oric.  
**Gameplay:** Trace Race/Pinball Wizard (Dragon 32), Colour Genie round-up, Hunter Killer/Mr Wymy (Spectrum), Crazy Caveman/Goodness Gracious (64).  
**Programs:** Jungle Chase (Oric).

**Screen Dump (BBC), Databases:** Hardware.  
**Microspedia:** Electron part 1.

**Issue 44, January 14, 1985.**  
**Pro-Tests:** Hitachi MBF-1602, Acorn Teletext (BBC), Integrex ColourJet printer, DTL-Base (64), Dian/Microprint 42:51/Multifont (Spectrum).  
**Features:** Adventure games, Colour Genie characters.  
**Gameplay:** Devil Assault/Wings + Dragon Race (Dragon 32), Siren City/Forbidden Forest (64), Survival/Countdown (Vic 20).  
**Programs:** Minefield.  
**Databases:** Peripherals.  
**Microspedia:** Electron part 2.

**Issue 45, January 21, 1985.**  
**Pro-Tests:** Portables - Commodore SX64, Olivetti M10, Acorn sparkler printer, Turbo 20 disc/wheel, Spectrum educational software: BBC graphics extension ROM.  
**Features:** Bargain buys; Making money with your micro.  
**Gameplay:** Viking and Pub Crawl (Dragon), Trax and Wild West Hero (Spectrum), Atari/Commodore 64 round-up.  
**Programs:** Battlerack Fighter (Commodore 64).  
**Databases:** Software.  
**Microspedia:** Electron part 3.



**Issue 46, January 28, 1985.**  
**Pro-Test:** Apple Macintosh; BBC review of ROM board; IEEE II interfaces for Commodore 64; Silver Reed EX44 typewriter/printer; Bridgeton (Spectrum and Dragon); BBC filing program.  
**Features:** Buying by mail order; Programming the Memotech.  
**Gameplay:** Barry Burgers and Gangsters (Spectrum), Birdie Barage and Plankwalk (BBC), Blue Moon and Dancing Feats (Commodore 64).  
**Programs:** Caves of Treasure (Dragon 32).  
**Clubset:** Microspedia: Modems and communication.

**Issue 47, February 4, 1985.**  
**Pro-Tests:** Sinclair QL; Atari Touch Table; Silver Reed EXP500 disc/wheel; IBM Cost-BBC Spell Check.  
**Features:** Programming the Memotech part 2; Low cost printers.  
**Gameplay:** Mothership and Quintic Warfare (Commodore 64), Two Gun/Turtle and Multigames (Oric), Apple adventures, Spectrum round-up.  
**Programs:** Pot Hole (Dragon).  
**Databases:** Hardware.  
**Microspedia:** A to Z of Atari part 1.



**Issue 48, February 11, 1985.**  
**Pro-Tests:** Spectravideo 328; Atari 800 XL; Dragon 3m disk drives; low cost monitors; Attec C (Apple); BBC educational software.  
**Features:** Sideways printing on Epson IHX20.  
**Gameplay:** Bedlam and Morris Meets the Bikers (Spectrum), Commodore 64 round-up; Zordon's Kingdom and Flight Zero-One/Fire (Vic 20).  
**Programs:** Gridtrap (Lynx).  
**Databases:** Peripherals.  
**Microspedia:** A to Z of Atari part 2.



**Issue 49, February 18, 1985.**  
**Pro-Tests:** Oric Almon; tracker ball controllers; Spectrum speech synthesizers; Rainbow Writer (Dragon); Colour Genie assembler; Spectrum educational programs.  
**Features:** Computer jargon; 42-column display on Spectrum.  
**Gameplay:** Quadran and Jetpac (Vic 20), Crazy Balloon and Zapachatroopa (Commodore 64).  
**Programs:** Sprite generator (Commodore 64).  
**Databases:** Software.  
**Microspedia:** A to Z of Atari part 3.

**Issue 50, February 25, 1985.**  
**Pro-Tests:** Sanyo MHC350; Commodore speech synthesiser; BBC real-time control interface; BBC machine code trace; Atari home utilities.  
**Features:** Expanding your Spectrum; introduction to Lisp.  
**Gameplay:** Urban Uppstart and Godzilla and the Martians (Spectrum), Shuttlezack and Hooked (Dragon).  
**Programs:** Minescape (Oric).  
**Clubset:** Microspedia: Printers part 1.

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
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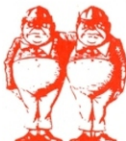
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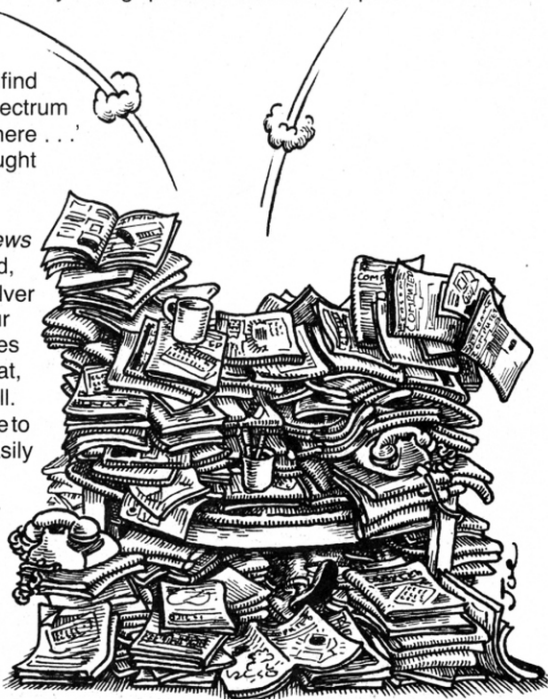
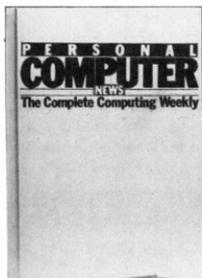
# For sufferers of PCNitus THE PCN BINDER

Since March 1983, a mysterious malady has afflicted thousands of people in Britain — PCNitus. The symptoms are perplexing. . . Those afflicted are found fighting their way through piles of Personal Computer



News magazines muttering strange things like 'can't find the Electron Pro-Test' and 'The Spectrum Micropaedia must be here somewhere . . .' But a recent breakthrough has brought instant relief to PCNitus sufferers. The cure is called the *Personal*

*Computer News binder*. It's red, yellow and silver and holds four months' copies completely flat, even when full. You'll be able to read them easily and refer to them quickly.



So if you recognise the symptoms above — take the cure now!  
Just fill in the coupon at the bottom of the page and send it with payment (£3.50 inc postage, VAT and handling) to the address below.

BINDER ORDER CARD. Please rush me \_\_\_\_\_ PCN binder(s) at £3.50 each. I enclosed my cheque made payable to Personal Computer News. Please charge my Access/Visa/Diners/American Express card (delete where not applicable)

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..... Signed .....

Send to Personal Computer News, Binders Department, 53/55 Frith Street, London W1A 2HG



# Free software, only £225.

Vector Marketing's ad for the BBC micro teletext adaptor has an odd way with words.

If free software costs £225, how much must the expensive

stuff be? Either there's a depth of subtlety to the ad that completely escapes us, or there's less to it than meets the eye. Steven Adams of London

N16 wins £5 in the PCN Misp-prints and Gibberish Contest for spotting it.

It's been quiet on the manuals front recently. Any offers?

## IBM — coming along nicely

There are a few things in life you can depend on — taxes, death, and IBM making vast profits spring immediately to mind.

IBM announced its most recent set of financial results for 1983 last week. Apparently it did £6.7 million's worth of business every working day. Chairman Sir Edwin Nixon was moved to say: 'Our progress last

year was again excellent.'

This could be the understatement of the year, except it leaves us wondering what IBM is progressing so excellently towards. And if £6.7 million a day isn't enough, how will it know when it's got there?

Finally, consider the threat to the world's cash flow if IBM starts working weekends.

## NEXT WEEK

**Key Grip** — Featured on the cover and tested inside, PCN looks at the reader-designed Microkey.

**Carry On** — Roving reporters file their feelings about book-size micros.

**Colour pen** — Atari's four-colour printer comes under the microscope.

**Games** — Dragon and Commodore 64 games.  
**Comms** — The communications micropaedia moves into its third and final part.

## SANTAX ERRORS

There was a slight problem in *Microwaves, Issue 55*. G.F. Sargent's tip about the additions to Perfect Software on the BBC should have had all the Cs as square brackets and all the Is as the vertical bracket line.

Upgrade Technology's Z80A second processor board for the BBC costs £288 plus VAT, not £263 as we reported last week. This is not a case of rampant inflation.

## Z80 puzzler

The Aquarius may be 'proof that computers can stretch your mind' (*Your Computer*, April, p186), but the advertisement for the 'the most reliable home computer in the world' may do more for your brain cells.

You're asked, 'What other computer includes a Z80 micro processor?' Answers on a (very large) postcard to Radofin, Hyde House, London NW9 6LG.

**PAL 2000**  
by Mollusc



## PCN DATELINES

PCN Datelines keeps you in touch with up-coming events. Make sure you enter them in your diary.

Organisers who would like details of coming events included in

PCN Datelines should send the information at least one month before the event. Write to PCN Datelines, Personal Computer News, 62 Oxford Street, London W1A 2HG.

## UK EVENTS

Event	Dates	Venue	Organisers
Computer Aided Design	April 3-5	Met. Exhibition Hall	Reed Exhibitions, 01-643 8040
Artificial Intelligence Seminar Sir Frederick Osborn School Computer Fair	April 7-8 April 8	City University, London Sir Frederick Osborn School, Welwyn Garden City	Warm Boot Ltd, 01-368 7561 Alan Henderson, Welwyn Garden 23367/8
COMPEC WALES Computers for Builders Exhibition	April 10-12 April 12	Cardiff University Cavendish Conference Centre, 82 New Cavendish Street, London W1	Reed Exhibitions, 01-643 8040 A4 Publications Ltd., 088-385 2051
Communications and Public Domain Software	April 14	Lancashire Country Council Cricket Club, Old Trafford	Robin Auld, 021-458 2175 (evenings only)
London Computer Fair Computers in Instrumentation Exhibition	April 19, 21, 23 April 16-18	Central Hall, Westminster, SW1 Earls Court, SW5	Tim Collins, 01-930 1612 Reed Exhibitions, 01-643 8040
Personal Computer Games Show	April 20-22	Solihull Conference Centre, Birmingham	Mike Carroll, 01-636 6890
ZX Microfair	April 28	Alexandra Palace, London N22	Mike Johnson, 01-801 9172

## OVERSEAS EVENTS

Event	Dates	Venue	Organisers
Hanover Fair	April 4-11	Hanover, Germany	Deutsche mess-und Ausstellungen AG Hanover, 01-651 2191
Videotex '84 Computerised Office Equipment Exhibition	April 16-18 May 1-3	Hyatt Regency, Chicago Rosemont, USA	Sally Summers, 0101 212 279 8890 Cahners Exposition Group, 0483 38085

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# The very best in arcade action-

is brought to you by Tansoft – the specialists of the Oric-1 and Atmos Computers.

The games that people are fighting for are:-  
**Defence Force:**

Pilot your space-craft through alien territory and fight off the enemy approaching from both sides. **48K. £7.95.**

**Ultima Zone:**

Shoot the Walkons, avoid the bouncing Brunes and battle your way through the satellite zone. **48K. £8.50.**

**Rat Splat:**

A revolting game. Splat the rats in the sewer before they consume the cheese, and destroy the monsters before they consume you! **48K. £7.95.**



## or let's get down to business!

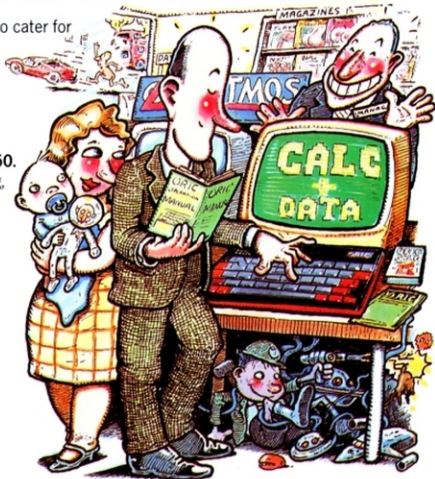
Tansoft produce a wealth of business and utility software to cater for every interest. The 'not so' games-minded people may be coming to grips with:-

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**Oric Calc:** A full spread-sheet program allows you to sum columns or rows and apply complex formulae. **48K. £14.50.**

**Oric Cad:** A computer aided design program for displaying, rotating, enlarging and shading objects on the screen. **48K. £9.99.**

For the full range of Tansoft software – which currently numbers over 20 titles – pick up a catalogue in your local Computer Store or contact Tansoft at Unit 1, The Techno Park, 645 Newmarket Road, Cambridge. Tel. Teversham (02205) 2261.



# TANSOFT



*Come on!  
it'll take the best of you  
to crack these two winners!*



*Bouncing  
bounders!...*

... fasten your safety belt and screw down your screen because you'll be jumping for your life with **POGO**, this fantastic, on the hop, all action fun-game from Ocean. Just bouncing around colouring steps may sound like child's play but only the toughest will jump at the **Pogo** challenge, and when the going gets tough the tough get going! Just you try to pogo up and down the stairs dodging all kinds of meanies and you'll get a taste of the real **Pogo** action. So rush right now to your local software shop and bounce out with this fun-packed winner... **Pogo** will have you jumping for joy... hopping mad... stair crazy... aaahh!

**POGO**  
Spectrum 48K  
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dizzy!...*

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